Service

Repair Manual
Jetta/Passat/Beetle 2013 ➤

Generic Scan Tool									
Engine ID	CPR A								

Edition 12.2017

Service

List of Workshop Manual Repair Groups

Repair Group

ST - Generic Scan Tool

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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Contents

ST – Generic Scan Tool

1 General Information

(Edition 12.2017)

Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related DTCs. The DTC table contains DTC Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and MIL Illumination information which can be used to accurately monitor and diagnose emissions related faults and perform functions required to run Modes 01 through 09 with a hand held scan tool. For a further description of specific monitor information, an OBD strategy document is referenced throughout this manual.

This manual also contains the step by step procedures to accurately diagnose and repair a component or system once a DTC has been set. References to repair procedures and wiring diagrams can be found within the diagnostic test procedures.

- ⇒ “1.1 Safety Precautions”, page 2
- ⇒ “1.2 Clean Working Conditions”, page 3

1.1 Safety Precautions

Check for Technical Bulletins that may supersede any information included in this manual.

WARNING

Failure to follow these instructions may result in personal injury or possible death.

Check the Technical Bulletins for information, cautions and warnings that may supersede or supplement any information included in this manual.

When performing the drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Test equipment must always be secured to the rear seat and operated by a second person. If test and measuring equipment is operated from the passenger seat, the person seated could be injured in the event of an accident involving deployment of the passenger-side airbag.

The fuel system is under pressure! Before opening the fuel system, place rags around the connection area. Then release pressure by carefully loosening the connection.

The engine section of the fuel system, after the high pressure pump, is under extremely high pressure! When working on engine or fuel injection system, fuel pressure must be relieved to residual pressure before opening high pressure components. Refer to the Service Manual for the proper procedure.

If the battery has not been disconnected, the fuel pump fuse must be removed before opening the fuel supply system as the fuel pump may be activated by the driver's door contact switch.

Testing of the EVAP and ORVR systems can result in the escape of explosive fuel vapor. Do not smoke while testing the EVAP system, and make sure the area you are working in is well ventilated.

Observe the following for all procedures, especially in the engine compartment due to lack of room:

- *Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- *Watch for sufficient clearance to all moving or hot components.*
- *Do not touch or disconnect the Ignition Coils, ignition wires, connecting parts or adapter cables when the ignition is on or the engine is running or turning at starting RPM.*
- *Only disconnect and reconnect wires for injection and ignition system, including test leads, when the ignition is turned off.*

When removing and installing components from full or partially full fuel tanks, observe the following:

- *The fuel tank must only be partially full. How much fuel can remain in the fuel tank may be read in the respective work description. Empty the fuel tank if necessary.*

- *Before starting work, switch on the exhaust extraction system and place an extraction hose close to the installation opening of the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a radial fan (as long as motor is not in air flow) with a displacement greater than 15 m^3/h can be used.*
- *Prevent fuel from contacting the skin. Wear fuel-resistant gloves!*

When servicing the engine control module (ECM), it may be necessary to use a heat gun. The heat gun, shear bolts, and parts of the protective housing will become extremely hot. Use extreme caution when working with or handling these parts to avoid personal injury.

Observe operating instructions when working with a heat gun. To prevent damage (burning) to the wiring and harness connections, insulation and the electronic components, perform outlined work steps exactly!

The cooling system is under pressure. To avoid scalding, use caution when opening the cooling system and servicing cooling system components!

Caution

The battery must only be disconnected and connected with the ignition switched off. Otherwise, the engine control module (ECM) can be damaged.

The use of nails, paper clips, or another unauthorized materials to back-probe electrical harness connectors is strictly prohibited and may cause damage to the electrical harness connectors, terminal ends or to a component. Use only the manufacturers test lead kit or an equivalent aftermarket test lead kit for back-probing all electrical harness connectors.

Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burnt in the engine and will damage the oxygen sensors.

Secure all hose connections with the correct hose clips (the same as original equipment).

If engine is to be cranked without starting, for example as part of a compression test, remove the fuses for the voltage supply of Ignition Coils and the fuel injector.

An electrostatic charge can lead to functional problems of electrical components of the engine, transmission and selector lever mechanism. Touch a grounded object, e.g. a water pipe or a hoist, before working on electrical components.

Do not make direct contact with electrical harness connector terminals.

Use only gold-plated terminals when servicing any component with gold-plated electrical harness connector terminals.

1.2 Clean Working Conditions

Even minor contaminations can lead to malfunctions in the fuel injection system. When working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

- Thoroughly clean all connections and the surrounding area before disconnecting.

- Place removed parts on a clean surface and cover. Use lint-free cloths.
- Carefully cover opened components or seal, if repairs are not performed immediately.
- When the system is open, do not work with compressed air. Do not move vehicle unless absolutely necessary.
- Install clean components: Remove the parts being replaced immediately prior to installation of the new parts. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- Electrical connectors that have been disconnected: Protect from dirt and moisture. Make sure connections are clean and dry when reconnecting.

2 Description and Operation

2.1 On Board Diagnostic Systems

On Board Diagnostics, or OBD, is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle sub-systems. Modern OBD implementations use a standardized digital communications port to provide real-time data in addition to a standardized series of Diagnostic Trouble Codes (DTCs) which allow one to rapidly identify and remedy malfunctions within the vehicle. Legislation mandates a vehicle equipped with OBD-II to light up the fault indicator lamp if its emissions exceed the prevailing limit due to system malfunction.

All cars built since January 1st, 1996 (MY 1996) are equipped OBD-II systems. Manufacturers started incorporating OBD-II in various models as early as 1994; however, some early OBD-II cars (MY 1994 and MY 1995) were not 100% compliant.

2.2 Evaporative Emission System

The evaporative emission system has been designed to minimize the release of hydrocarbons from the fuel system into the atmosphere. The evaporative emission system components all work together with the ECM to prevent fuel vapor from escaping and route it to the intake manifold to be burned during normal combustion.

The leak detection system checks the integrity of the evaporative emission system by pressurizing the system.

- There are 3 different types of evaporative emission systems used. These systems are explained below.

- ⇒ “2.2.1 Leak Detection Pump (LDP) Evap System”, page 6
- ⇒ “2.2.2 Tank Leak Diagnostic Module (DM - TL) Evap System”, page 6
- ⇒ “2.2.3 Natural Vacuum Leak Detection (NVLD) Evap System”, page 6
- ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6

2.2.1 Leak Detection Pump (LDP) Evap System

The leak detection pump (LDP) is integrated into the EVAP system and can have two functions. The LDP can:

- ♦ Pressurize the EVAP system and detect a drop in pressure that would indicate a leak.
- ♦ Function as the EVAP Canister Vent on vehicles that do not have a separate EVAP Canister Vent.

The LDP is a vacuum-driven, ECM controlled, diaphragm pump. In order to operate, the engine must be running and vacuum applied to the Vacuum Switch.

2.2.2 Tank Leak Diagnostic Module (DM - TL) Evap System

The canister purge valve can be actively checked using the Tank Leak Diagnostic Module (DM - TL). For this purpose the electric pump is shortly activated while the combustion engine is running, to build up a minor pressure in the fuel tank and monitor the pressure decay after opening the canister purge valve. Optionally as a quick pass method, the monitoring can be carried out by passively monitoring the fuel mixture deviation when the canister purge valve is opened. If a significant fuel mixture deviation is detected, the purge valve monitor passes. The Tank Leak Diagnostic Module (DM - TL) consists of an electrically operated air pump, an orifice with a defined diameter serving as a reference leak, and a change-over valve switching the air flow between the reference leak and the tank. If neither the pump nor the change-over valve is activated, the tank is ventilated through a bypass in the module.

2.2.3 Natural Vacuum Leak Detection (NVLD) Evap System

The system utilizes an engine-off natural vacuum evaporative system integrity check that tests for leaks with a diameter of 0.020 inch while the engine is off and the ignition is off. The natural vacuum leak detection (NVLD) evaporative system integrity check uses a pressure switch to detect evaporative system leaks. The correlation between the pressure and the temperature in a sealed system is used to generate a vacuum in the tank when the temperature drops. If a sufficient temperature drop is detected for a minimum time period, the vacuum level in a sealed system will exceed the threshold to close the NVLD pressure switch. Therefore, if the switch does not close under these conditions, a leak is detected. If the switch closes, the system is considered to be leak-free.

2.2.4 EVAP System, Checking for Leaks

The following procedure is used to diagnose EVAP System leaks.

Special tools and workshop equipment required

- ♦ Smoke tester.
- ♦ EVAP and Fuel Supply System Vacuum hose and line routing diagram.

Leak checking

- – Using a Smoke tester, check the Evaporative Emission (EVAP) canister system for leaks.
- – Always follow the manufacturers directions for the proper installation and operation of the smoke tester being used.

If a leak is detected:

– Check the fuel filler cap seal for damage and for proper installation. Replace if necessary.

– Check all hose connections of the fuel supply system and replace or repair any leaking lines.

– Check all hose connections of the EVAP system and replace or repair any leaking lines.

– Check that the seal under the locking flange is properly tightened on the fuel tank.

– Secure all hose connections using appropriate fittings for the model type.

– Replace seals and gaskets when performing repair work.

– Repair or replace any damaged component.

If no leaks are found in the EVAP system:

– Erase the DTC memory if a DTC was set. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 .

– Perform a road test to verify repair.

If a DTC was set and does not return:

Diagnosis complete. Generate readiness code. Refer to ⇒ “3.2 Readiness Code”, page 14 .

If the same DTC does return and no leaks are found in the EVAP system:

– Check for any related TSB's.

– Perform the diagnostic test procedure for the suspected component.

2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.

2.4 Electronic Power Control (EPC) Warning Lamp

When the ignition is switched on, the engine control module (ECM) checks the electronic throttle control system for static system integrity (e.g. circuit integrity, communications, etc); the electronic power control (EPC) warning light is turned on via the Instrument Cluster during this process. Shortly after engine start,

the EPC warning light is turned off if no malfunction in the electronic throttle control system is detected. In the event of a malfunction while the engine is running, the ECM will activate the EPC warning light via the Instrument Cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.5 Engine Control Module (ECM)

The Engine Control Module (ECM) is a generic term for any embedded system that controls one or more of the electrical systems or subsystems in a vehicle. It controls a series of actuators on an internal combustion engine to ensure that driver commands (e.g. to accelerate) are translated into appropriate engine performance. It reads values from a multitude of sensors, interprets the data, and adjusts the engine actuators accordingly. The ECM also interacts with the transmission control module (TCM), ABS/traction/stability control module and other vehicle function related control systems.

ECM controlled systems and functions (performance and emission related) will be introduced in the following chapters. These include the OBD system, controller area network (CAN), throttle control module, fuel supply, ignition, variable valve timing, exhaust-gas recirculation, secondary air injection, exhaust system, and EVAP system.

2.6 Malfunction Indicator Lamp (MIL)

When the ignition is switched on, the Engine Control Module (ECM) performs checks on static system integrity (e.g. circuit integrity, communications, etc). The Malfunction Indicator Lamp (MIL) is switched on during this process via the Instrument Cluster. After engine starts, the ECM examines engine operation for potential malfunction(s) or failure(s) that can lead to increased emission values. If no malfunction is detected, the ECM switches off the MIL via the Instrument Cluster.

In the event of a malfunction during the operation of the engine, the ECM will activate the MIL via the instrument cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory. In OBD systems, the MIL can have up to three stages: steady, flashing and Stop Vehicle. A steady MIL indicates a minor fault (e.g. a failing oxygen sensor) whereas a flashing MIL indicates a more severe malfunction that could result in damage of engine or exhaust system components (e.g. the catalytic converter) if left uncorrected for an extended period. This would also indicate a severe fault. The three stages are 1. ON, then OFF; 2. ON steady; 3. flashing constantly. The 3rd stage indicates damage may occur and driver must stop.

2.7 Controller Area Network (CAN)

Overview

The Controller Area Network (CAN) bus is a message-based protocol that allows control units and devices to communicate with each other using a shared network. With this system, control units of the various electronic systems are no longer interconnected by multiple separate cables. This does away with a large number of electrical connections and results in a reduced likelihood of failure of the device network.

Broadcast Communication

Each of the devices on the network has a CAN circuit and is therefore is considered “intelligent”. All devices on the network see all transmitted messages. Each device can determine if a message is relevant or if it should be filtered out. This structure allows modifications to CAN networks with minimal impact. Addi-

tional non-transmitting nodes can be added without modification to the network.

Priority

Every message has an assigned priority. If two nodes try to send messages simultaneously, the one with the higher priority gets transmitted and the one with the lower priority gets postponed. This arbitration does not affect other messages and results in non-interrupted transmission of the highest priority message

2.8 Fuel Supply

Overview

The fuel supply system delivers fuel to an internal combustion engine. With carburetors being replaced by fuel injections systems in the late 1980s and 1990s, the most common types of fuel supply system currently in use are throttle body injection (single-point injection), multiport injection (MPI) and direct injection (DI).

Fuel injectors atomize fuel because high pressure is forcing the fuel through a small nozzle in the injector into the intake air stream or the combustion chamber. This process is often controlled by the ECM and is dependent on data received from other sources (e.g. mass air flow sensor, throttle position sensor, etc.) to determine the precise amount of fuel needed for any given operating condition. The primary advantages of fuel injection over carburetor are improved fuel economy, increased power output and reduced emissions. The following sections will discuss each fuel injection concept in detail.

Throttle Body Injection

Throttle body injection uses a single electrically controlled injector at the throttle body. The fuel is drawn by an electric fuel pump out of the fuel tank and flows through a paper filter into the fuel injector. Since injection happens at the same location as the carburetor, very little engine redesign (intake manifold, fuel line routing, etc.) is necessary. The cost saving of throttle body injection compared to other fuel injection methods encouraged vast adoption in the late 1980s and early 1990s.

Throttle body injection system also inherits many disadvantages of the carburetor. One of them being the inability to precisely control the amount of fuel supplied into each cylinder, and is unable to precisely control combustion and emissions. It also restricts the design of intake manifold as any sharp bends in the intake path will cause atomized fuel to accumulate on the outer wall of the intake path. Supplying moderate engine heat to the intake manifold is also necessary to ensure that the fuel stay vaporized. This results in a relatively high intake air temperature and compromises performance.

Multiport Injection (MPI)

Multiport injection (MPI) consists of an injector for each cylinder just upstream of the intake valve. The fuel pump delivers the fuel into a high-pressure line where it flows to the fuel rail and injectors. When activated by the ECM, each injector sprays fuel at the intake port of its corresponding cylinder – this allows individual cylinders to receive the right amount of fuel in a more precisely timed manner. Sequential fuel injection mode can be applied to activate each injector individually to improve engine response. Lowered fuel consumption and emissions are also achieved.

Sequential multiport injection is still the most common fuel injection system found on most economy cars thanks to its high efficiency, control simplicity and low manufacturing cost (compared to direct injection). However, to further improve drivability (performance) while reducing emissions and fuel consumption, direct injection becomes a superior alternative.

Direct Injection

Injectors in directly injected (DI) engines are mounted on the cylinder head and fuel is injected directly into the engine's combustion chamber. In order to overcome the pressure in the combustion chamber during compression and power stroke, injectors often operate at a primary pressure as high as 3000 psi. At such extreme pressure level, no single fuel pump can supply the required pressure directly from the fuel tank to the injectors. Instead, a low-pressure and a high-pressure system are employed. The low-pressure system principally utilizes the same fuel systems and components for multiport injected engines. The high-pressure system consists of a high-pressure fuel pump driven directly by the camshaft, a fuel rail (high-pressure accumulator), a high-pressure sensor and, depending on the system, a pressure-control valve or a pressure limiter. The injectors are operated by the ECM to send a precise amount of fuel from the high-pressure rail directly into the combustion chamber.

The distinctive difference between direct injection and other injection methods is that direct injection offers the flexibility regarding when in the combustion cycle the fuel is added and how. MPI systems can only add fuel during induction; A DI system can add fuel whenever it needs to. For example, fuel can be added during induction to create a homogeneous charge then added again after ignition to enhance power delivery under full load conditions.

VW/Audi Fuel Stratified Injection (FSI)

The goal of a stratified-charge operation is to form an ignitable mixture near the spark plug at the instant of ignition. This means that, instead of supplying the corresponding stoichiometric fuel quantity to the amount of air in the combustion chamber, the fuel interacts only with a portion of the air before it is conveyed to the spark plug. The rest of the fresh air surrounds the stratified charge allowing an ultra-lean condition with air-fuel ratio exceeding 50:1 in some instances. As less fuel is used to “burn” more air, stratified injection helps to further reduce fuel consumption when the engine is operating in low-load conditions (e.g. highway cruising). This is created by designing the combustion chamber so that a “swirling” effect of the air-fuel charge is caused.

2.9 Ignition and Timing

Ignition

A spark ignition (SI) engine requires a spark to initiate combustion in the combustion chamber. Voltage is supplied to the spark plug where the electricity will arc across a gap at a voltage as high as 100 kilovolts. The ECM determines the precise moment to fire each spark plug using ignition logic which is pre-programmed into the ECM as a function of engine speed and load. An optimally calibrated ignition system ensures consistent and reliable ignition under all conditions. Knock or misfire as a result of incorrect ignition can lead to destruction of engine components or damage of the catalytic converter.

Timing

Shifts in the moment of ignition (ignition timing) can result in increased emissions, decreased performance and fuel economy. Whereas more spark advance improves power and fuel economy, it also raises HC and NOx emissions. Excessive spark advance can cause engine knock which is potentially destructive to engines. If the ECM detects knock from a signal sent by a knock sensor, it will delay (retard) the timing of the spark. Excessive spark retard lowers power output and produces high exhaust temperatures, which can also harm the engine. Carefully designed ignition logic provides optimum timing that best balances performance, fuel economy and emissions.

2.10 Variable Valve Timing

Engines equipped with variable valve timing provide the option of adjusting the phase of the camshaft with respect to the crankshaft. This allows the ECM to control the time at which the valves open or close, and therefore better assists engine “breathing” at various engine speeds. When engine speed increases, the duration of intake and exhaust stroke shortens so that less fresh air can be drawn into the combustion chamber and less exhaust gas can escape. In such a scenario, the ECM opens the intake valve before the exhaust gas has completely left the combustion chamber, and their considerable velocity assists in drawing in the fresh charge – this is referred to as “valve overlap”.

In addition to valve timing, some engines also employ variable valve lift that switches to a more aggressive camshaft-lobe profile as engine speed increases. A more aggressive camshaft-lobe profile actuates valves more rapidly and lifts valves to a greater magnitude in comparison to a normal camshaft-lobe profile. This improves intake and exhaust flow rate, allowing engines to raise maximum operating speed and power output.

2.11 Exhaust-Gas Recirculation (EGR) System

Exhaust-Gas Recirculation (EGR) can be utilized to control the cylinder charge and therefore the combustion process. The exhaust gas that is recirculated to the intake manifold increases the proportion of inert gas in the fresh gas filling; this results in a reduction in the peak combustion temperature and, in turn, a drop in temperature-dependent NOx emission.

Exhaust-gas recirculation is made possible by a connection between the exhaust pipe and the intake manifold. Due to the pressure differential, the intake manifold can draw in exhaust gas via this connection. Together with the exhaust-gas recirculation valve, the ECM adjusts the opening cross-section and therefore controls the partial flow tapped from the main exhaust flow. A malfunction in exhaust-gas recirculation system can result in performance loss and increased emissions. In such a scenario, the Malfunction Indicator Lamp (MIL) lights up and a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.12 Secondary Air Injection

Additionally injecting air into the exhaust pipe triggers an exothermic (release of heat) reaction. This leads to the combustion of HC and CO components that prevail mainly during the warm up phase. This oxidation process releases additional heat. Consequently, the exhaust gas becomes hotter, causing the catalytic converter to heat up at a faster rate. For spark-ignition engines, secondary-air injection is an effective means of reducing HC and CO emissions after starting the engine and to rapidly heat up the catalytic converter. This ensures that the conversion of NOx emissions commences earlier.

An electronically controlled valve operates the secondary-air valve (a one-way check valve). The ECM actuates the pump and the control valve, ensuring that secondary air can be injected at a defined point in time. The secondary air must also be injected as close to the outlet valve as possible in order to exploit the high temperatures to utilize the exothermic (release of heat) reaction effectively.

2.13 Exhaust Systems

Overview

There are three important functions of the exhaust system: to reduce the pollutants in exhaust gas, muffle engine combustion noise and to discharge exhaust gas at a convenient location on

the vehicle (often underneath the rear bumper). A passenger-car exhaust system consists of the following; exhaust manifold, exhaust treatment components, sound absorption components and the system of pipes connecting these components.

Exhaust Manifold

The manifold is an important component in the exhaust system. It routes the exhaust gas out of the cylinder outlet ports into the subsequent exhaust system. The geometry of the manifold (i.e. length and cross-section of the individual pipes) has an impact on the performance characteristics, the acoustic behavior of the exhaust system, and the exhaust temperature. In some cases, the manifold is insulated with an air gap to quickly reach high exhaust temperature and to shorten the time taken by the catalytic converter to reach its operating temperature.

Emission Control

The primary emission control component is the catalytic converter, which breaks down the gaseous pollutants in the exhaust gas (CO, HC and NOx). Catalytic converters are installed as close as possible to the engine so that they can quickly reach their operating temperature and therefore be effective in urban driving. It also bears a sound-absorbing function, especially to the higher frequency portion of the engine combustion noise.

Sound Absorption

Mufflers dampen or absorb the noise produced by engine combustion. In principle, they can be installed at any position in the exhaust system. However, they are mostly located in the middle and rear sections of the exhaust system. Depending on the number of cylinders and engine output, generally 1 to 3 mufflers are used in an exhaust system. In V-engines, the left and right cylinder banks are often run separately, each being fitted with its own catalytic converters and mufflers. Although the aim of mufflers is to reduce noise in compliance with legislations, they can also help to create the sound specific to the type of vehicle.

3 Diagnosis and Testing

3.1 Preliminary Check

Note

- *Before performing any pin point test or component diagnosis, a Preliminary Check must be performed.*
- *Check for Technical Bulletins that may supersede any information included in the repair manual or GST Manual.*

- For Electrical Testing: Refer to ⇒ page 13 .
- For Fuel System Mechanical Testing: Refer to ⇒ page 14 .
- For Oxygen Sensor Preliminary Tests: Refer to ⇒ page 14 .

Electrical Testing

Step	Procedure	Result / Action to Take
1	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: For stored or related DTCs. – Were any other DTCs stored?	– YES: ♦ GO TO: Step 2 ⇒ page 13 . – NO: ♦ GO TO: Step 3 ⇒ page 13 .
2	• Repair these DTCs first before performing any of the following steps.	♦ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ “3.4 Engine DTC Tables”, page 61 .
3	• Using the Scan Tool, erase the DTC memory. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . • Perform a road test to attempt to duplicate the customers complaint. – Does DTC return?	– YES: ♦ GO TO: Step 4 ⇒ page 13 . – NO: ♦ GO TO: Step 5 ⇒ page 13 .
4	• Perform the diagnostic procedure for that DTC.	♦ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ “3.4 Engine DTC Tables”, page 61 .
5	• FAULT: Intermittent or a sporadic condition. • CHECK: Suspected components. • PERFORM: Visual Inspection of wiring and components. • CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. • REPAIR: Faulty wiring or connector.	♦ Perform a road test to verify the repair. ♦ Generate readiness code. Refer to ⇒ “3.2 Readiness Code”, page 14 .

Fuel System Mechanical Testing

Check the following items for possible mechanical delivery deficiency:

- Fuel level in tank is too low.
- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump delivery unit internal leak.
- Clogged injectors.
- Poor fuel quantity delivery. Refer to appropriate repair manual.

Oxygen Sensor Preliminary Tests

Check for the following conditions which can cause Oxygen Sensor Faults to set without requiring Oxygen Sensor replacement:

Common issues for lean faults:

- ♦ Vacuum leaks - check for failed or loose vacuum lines, leaking intake gaskets, or any other source of un-metered air leaks (leaks after the Mass Air Flow Sensor).
- ♦ Restricted fuel filter or bent/pinched fuel system lines.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Engine misfire.
- ♦ Exhaust leaks.
- ♦ Camshaft timing.

Common issues for rich faults:

- ♦ Leaking or faulty fuel injector.
- ♦ Fuel injector driver shorted in ECM, or wiring short for injectors (short to ground).
- ♦ Leaking or faulty fuel pressure regulator or restricted return line.
- ♦ Faulty fuel pump or fuel pump driver module.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Aftermarket components or performance chips.
- ♦ Camshaft timing.

3.2 Readiness Code

> ⚠ Caution
>
> *When performing the Readiness drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.*

Readiness code description

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions related system, a readiness code is generated by road testing the vehicle.

If a malfunction is recognized during the drive cycle, it will be stored in the DTC memory.

The OBD drive cycle operation will be monitored with a hand held diagnostic tool. Consult the manufacturer's instruction manual for correct tool operation.

The readiness code is erased every time the DTC memory is erased or any time the battery is disconnected. If the DTC memory has been erased or the battery is disconnected, a new readiness code must be generated.

Only erase the DTC memory if a DTC has been stored.

General recommendations

Most monitors will complete easier and quicker using a "steady-foot" and "smooth" acceleration during the drive cycle operation.

Operating conditions

For the EVAP monitor test, the coolant temperature and the ambient air temperature must be between 10° C and 35° C with a difference between them no greater than 4° C. The ambient air temperature must not change more than 4° C during the drive cycle procedure (e.g. when driving out of a heated workshop in the winter).

Note

Do not assume that the scan tool ID and engine code are correct if the scan tool communicates. The scan tool does not use the ID to establish communication—the units are automatically identified.

Test requirements

- NO DTC in memory.
- Switch OFF all electrical and electronic accessories.
- Necessary driving speed: 50 – 70 mph.
- Drive profile takes approximately 60 – 90 min.

Readiness Drive Cycle Procedure

– CONNECT: Scan Tool.

Step	Procedure	Result / Action to Take
1	Activate Monitors: • START: Engine and idle for 2 – 3 min.	♦ Monitoring Active. ♦ Executes Misfire Monitoring.
2	O2 Sensor Monitoring: • DRIVE: Vehicle at 45 – 55 mph for a continuous 7 minute period. Avoid stopping.	♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes EVAP Monitoring.
3	Fuel Cut-Off Monitoring: • ACCELERATE: Vehicle to an engine speed of 5,000 RPM; lift off the throttle until the engine speed is around 1,200 RPM.	♦ Fuel Cut-Off Monitoring Ready.

Step	Procedure	Result / Action to Take
4	Catalyst Monitoring: • ACCELERATE: Vehicle smoothly to 60 – 65 mph, cruise at a constant speed for 5 min.	♦ Executes Catalyst Monitoring. ♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes Misfire Monitoring. ♦ Executes EVAP Monitoring.
5	Secondary Air Injection, EVAP Monitoring: • DRIVE: Vehicle for 30 – 40 min. at a constant speed of 50 – 70 mph in high gear for 2 min with no coasting.	♦ Executes Secondary Air Injection Monitoring. ♦ Executes EVAP Monitoring. • Check the status of the readiness code.

– If any engine monitor fails the drive cycle test. Repeat the drive cycle test until all engine monitors have successfully run through and passed.

Note

- ♦ *When repeating the drive cycle operation for a failed evaporative or thermostat monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are between 10° C and 35° C with a difference between them no greater than 4° C and then repeat the drive cycle operation.*
- ♦ *Depending on the scan tool used, the readiness code status may be displayed as complete, passed or OK. At an ambient air temperature < 7° C, the setting of the readiness for the NOx catalytic converter test is delayed. Here the vehicle must be driven considerably longer.*

Readiness Codes and Monitoring Completed

1 - If any engine monitor fails the drive cycle test, repeat the drive cycle test until all engine monitors have successfully run through and passed.

2 - If the drive cycle operation fails again:

3 - Check the DTC memory for stored DTCs.

4 - Repair the vehicle if necessary.

5 - Repeat the drive cycle operation until all engine monitors have successfully run through and passed.

6 - Remove the scan tool and switch the ignition off.

3.3 Diagnostic Modes 01 - 09

The information provided in Modes 01 through 09 displays the various levels of emission related data that may be monitored, as well as the ability to retrieve and read stored DTC trouble codes, erase stored DTC trouble codes, generate readiness codes, and select the various PIDs and Test-IDs used within the modes to monitor the engine, and emission related component parameters.

Note

Depending on scan tool and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

- ⇒ “3.3.1 Diagnostic Mode 01 - Read Current System Data”, page 17
- ⇒ “3.3.2 Diagnostic Mode 02 - Read Operating Conditions”, page 19
- ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20
- ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21
- ⇒ “3.3.5 Diagnostic Mode 05 - Read Oxygen Sensor Monitoring Test Results”, page 22
- ⇒ “3.3.6 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2013 – 2014 MY”, page 22
- ⇒ “3.3.7 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2015 MY”, page 33
- ⇒ “3.3.8 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2016 MY”, page 41
- ⇒ “3.3.9 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2017 MY”, page 49
- ⇒ “3.3.10 Diagnostic Mode 07 - Read Faults Detected During the Current or Last Driving Cycle”, page 57
- ⇒ “3.3.11 Diagnostic Mode 08 - Request Control of On-Board System, Test or Component”, page 57
- ⇒ “3.3.12 Diagnostic Mode 09 - Read Vehicle Information”, page 58
- ⇒ “3.3.13 Diagnostic Mode 0A - Check Permanent DTC Memory”, page 59

3.3.1 Diagnostic Mode 01 - Read Current System Data

Diagnostic Mode 01 makes it possible to access current emissions-related measured values and diagnostic data. The original measured values (no replacement values), input and output data and system status information are displayed using Diagnostic Mode 1.

Test requirement

- Coolant temperature at least 80° C.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 1: Obtain data.”.

– From the following table, select the desired the “PID” that is to be monitored, e.g. “PID $05 Coolant temperature”.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
$01:	Monitoring Status Since Erasing DTC Memory
$03:	Condition Of Fuel System
$04:	Calculated Load Value
$05:	Coolant Temperature
$06:	Short Term Air Fuel Ratio
$07:	Long Term Air Fuel Ratio
$0B:	Intake Manifold Absolute Pressure
$0C:	Engine RPM
$0D:	Vehicle Speed
$0E:	Ignition Timing Advance For #1 Cylinder
$0F:	Intake Air Temperature
$10:	Air Flow Rate From Mass Air Flow Sensor
$11:	Absolute Throttle Position
$12:	Secondary Air Injection
$13:	Oxygen Sensor Bank 1 Sensor 1
$15:	Oxygen Sensor Bank 1 Sensor 2
$16:	Oxygen Sensor Bank 1 Sensor 3
$1C	OBD Requirements
$1F:	Time Since Engine Start
$21:	Distance Driven With MIL On
$23:	Fuel Rail Pressure
$2E:	Commanded Evap Purge
$2F:	Fuel Level Input
$30:	Warm Up Counts After MIL Erased
$31:	Distance Driven After Erasing DTC Memory
$33:	Barometric Pressure
$34:	Heater Current Bank 1 Sensor 1
$3C:	Calculated Catalyst Temperature
$41:	Monitor Status Current Drive Cycle
$42:	Control Module Voltage
$43:	Absolute Load Value
$44:	Specified Value Of Oxygen Sensor Signal
$45:	Relative Throttle Valve Position
$46:	Ambient Temperature
$47:	Throttle Valve Position 2 Absolute
$49:	Accelerator Pedal Position 1 Absolute
$4A:	Accelerator Pedal Position 2 Absolute
$4C:	Specified Throttle Valve Position
$51	Type Of Fuel Currently Being Used
$56:	Offset Oxygen Sensor Regulation After Catalytic Convertor
$6D:	Fuel Pressure Control System

– Switch the ignition off.

3.3.2 Diagnostic Mode 02 - Read Operating Conditions

When an emissions-related fault (pending DTC, visible in mode 07) is first detected, operating conditions are stored. Mode 02 makes it possible to access this freeze frame data as soon as this fault is shown in mode 03. Each control module only shows freeze frame data for one fault via mode 02. Therefore, there are two priority levels. If there is a malfunction with higher priority, the freeze frame data is overwritten.

– Fault with higher priority: Misfire malfunction or fuel trim malfunction.

– Fault with normal priority: All other emissions-related faults.

Note

Depending on scan tool and protocol used, the information in diagnostic mode 02 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward.

– Select “Diagnostic Mode 2: Obtain operating conditions.”.

– From the following table, select the desired the “PID”, e.g. “PID $05 Coolant temperature” that is to be monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
$02:	DTC Which Triggered Freeze Frame Data
$03:	Fuel System Status
$04:	Calculated Load Value
$05:	Coolant Temperature
$06:	Short Term Air Fuel Ratio
$07:	Long Term Air Fuel Ratio
$0B:	Intake Manifold Absolute Pressure
$0C:	Engine RPM
$0D:	Vehicle Speed
$0E:	Ignition Timing Advance For #1 Cylinder
$0F:	Intake Air Temperature
$10:	Air Flow Rate From Mass Air Flow Sensor
$11:	Throttle Valve Position 1 Absolute
$12:	Secondary Air Injection
$1F:	Time Since Engine Start
$23:	Fuel Rail Pressure

PID	Component or System
$2E:	Commanded Evap Purge
$2F:	Fuel Level Input
$33:	Barometric Pressure
$42:	Control Module Voltage
$43:	Absolute Load Value
$44:	Commanded Equivalence Ratio
$45:	Relative Throttle Valve Position
$46:	Ambient Temperature
$47:	Throttle Valve Position 2 Absolute
$49:	Accelerator Pedal Position 1 Absolute
$4A:	Accelerator Pedal Position 2 Absolute
$4C:	Specified Throttle Valve Position
$51	Type Of Fuel Currently Used
$56:	Offset Oxygen Sensor Regulation After Catalytic Convertor
$6D:	Fuel Pressure Control System

– Switch the ignition off.

3.3.3 Diagnostic Mode 03 - Read DTC Memory

Diagnostic Mode 03 makes it possible to read emissions-related faults (confirmed DTCs: faults which have activated the MIL) in the ECM and in the TCM.

When the ECM recognizes an emission related fault it turns on the malfunction indicator lamp. If an electronic throttle malfunction is recognized, the ECM turns on the electronic power control warning lamp. Both are located in the instrument cluster.

The DTCs are sorted by SAE code with the DTC tables consisting of a 5 digit alpha numeric value.

Note

Depending on scan tool and protocol used, diagnostic mode 03 and the information provided may be referred to by a different name.

The following tables provide a breakdown and explanation of the DTC code.

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTCs provided by the manufacturer
P	2	x	x	x	DTCs defined by SAE with specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTCs provided by the manufacturer from MY 2000

Component group					
Repair group					
P	x	0	x	x	Fuel and air mixture and additional emission regulations
P	x	1	x	x	Fuel and air ratios
P	x	2	x	x	Fuel and air ratios
P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN bus)
Norm-Code					
U	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts

Procedure

– Connect the scan tool.

– Switch the ignition to the ON position.

– Select Diagnostic Mode 03: Interrogating fault memory.

– The stored DTC or DTCs will be displayed on the scan tool screen.

The following table is an example of the DTC information that may be displayed on the scan tool screen:

Indication example	Explanation
P0444	SAE Diagnostic Trouble Code
Evaporative emission canister purge regulator valve	Malfunctioning wiring path or malfunctioning component
Circuit open	Malfunction type as next

– Refer to the following DTC tables for the diagnostic repair procedures.

♦ ⇒ “3.4 Engine DTC Tables”, page 61

♦ ⇒ “3.5 Transmission DTC Tables”, page 805

– Switch the ignition off.

3.3.4 Diagnostic Mode 04 - Erase DTC Memory

Diagnostic Mode 04 makes it possible to erase the DTC memory and to reset all emissions-related diagnostic data. In that way, all faults in the DTC memory in the ECM and TCM are erased. The adaptation values may also be reset.

Emissions-related diagnostic data includes (as applicable):

- - MIL Status
- - Number of DTCs
- - Readiness bits
- - Confirmed DTCs
- - Pending DTCs
- - DTC that belongs to freeze frame
- - Freeze frame data
- - Test results of specific diagnostic functions
- - Distance driven with “MIL ON”
- - Number of warm-up cycles after erasing the DTC memory
- - Distance driven after erasing the DTC memory
- - Misfire counter

Note

Depending on scan tool and protocol used, diagnostic mode 04 and the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.

– Switch the ignition on.

– Select Diagnostic Mode 03: Interrogating fault memory.

– Then select Mode 4: Reset/delete diagnostic data.

The scan tool will display: Diagnostic data are being erased.

– Switch the ignition off.

3.3.5 Diagnostic Mode 05 - Read Oxygen Sensor Monitoring Test Results

Note

Mode 05 may not be supported on all systems. On systems where Diagnostic Mode 05 is not supported, refer to Diagnostic Mode 6 for oxygen sensor Monitoring Test Results.

3.3.6 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2013 – 2014 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan

tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Mode 6: Check test the results of components that are not continuously monitored.

Select the desired Test-ID..

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all“Test-IDs” that may be selected.

Monitor-ID (Hex-ID)	Component or System
$01: ⇒ page 23	Oxygen Sensor Monitor Bank 1 - Sensor 1
$02: ⇒ page 24	Oxygen Sensor Monitor Bank 1 - Sensor 2
$03: ⇒ page 25	Oxygen Sensor Monitor Bank 1 - Sensor 3
$21: ⇒ page 25	Catalytic Converter Monitoring
$35: ⇒ page 26	Camshaft Adjustment / VVT Bank 1
$3A: ⇒ page 26	Fuel Tank EVAP System Integrity/Leak Test (0.90”)
$3B: ⇒ page 27	Fuel Tank EVAP System Integrity/Leak Test (0.40/1.0 mm)
$3C: ⇒ page 27	Fuel Tank EVAP System Integrity/Leak Test (0.20/0.5 mm)
$3D: ⇒ page 28	EVAP Valve Function Check
$41: ⇒ page 29	Oxygen Sensor Heater Monitor Bank 1 - Sensor 1
$42: ⇒ page 29	Oxygen Sensor Heater Monitor Bank 1 - Sensor 2
$43: ⇒ page 30	Oxygen Sensor Heater Monitor Bank 1 - Sensor 3
$71: ⇒ page 30	Secondary Air Injection System
$A2: ⇒ page 31	Mis-Fire Cylinder 1 Data
$A3: ⇒ page 31	Mis-Fire Cylinder 2 Data
$A4: ⇒ page 31	Mis-Fire Cylinder 3 Data
$A5: ⇒ page 32	Mis-Fire Cylinder 4 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 - Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.
– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.
– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Response Check Bank 1 Sensor 1.	0.250 V	1.999 V	Refer to DTC P0133 in the DTC summary table. ⇒ page 80 .
$84	P2195 / P2196	Front to rear rationality Bank 1 Sensor 1.	-0.080 V	0.080 V	Refer to DTC P2195 / P2196 in the DTC summary table. ⇒ page 183
$89	P0133	Signal dynamic Bank 1 Sensor 1.	0.250 V	1.999 V	Refer to DTC P0133 in the DTC summary table. ⇒ page 80 .
$8A	P2195	Oxygen Sensor Lean Fault Detection Bank 1 - Sensor 1	-32.768	0.890	Refer to DTC P2195 in the DTC summary table. ⇒ page 183 .
$8B	P2196	Oxygen Sensor Rich Fault Detection Bank 1 - Sensor 1	1.060	32.767	Refer to DTC P2196 in the DTC summary table. ⇒ page 184

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .
– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1- Sensor 2

– Connect the scan tool.
– Start the engine and run at idle.
– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.
– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P013A	Deceleration test - O2 transient time.	0 Sec.	0.500 Sec.	Refer to DTC P013A in the DTC summary table. ⇒ page 86 .
$81	P2271	Output Voltage rich during decel.	0 V	0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 191
$82	P2270	Output Voltage lean during accel.	0.5980 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 188
$8A	P2271	Deceleration test response time.	0 V	0.1495 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 191

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8E	P2270	Oxygen Sensor Maximum Oscillation Voltage	0.75200 V	7.99 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 188
$8F	P2271	Oxygen Sensor Minimum Oscillation Voltage	0 V	0.15100 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 191

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 - Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $03”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P0145	Deceleration test - O2 transient time.	0 m/ Sec.	1.200 Sec.	Refer to DTC P0145 in the DTC summary table. ⇒ page 98
$81	P2275	Output Voltage rich during decel.	0 V	0.8018 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 193
$82	P2274	Output Voltage lean during accel.	0.5980 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 193
$8A	P2275	Deceleration test response time.	0.000 V	0.1495 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 193
$8E	P2274	Oxygen Sensor Maximum Oscillation Voltage	0.69800 V	7.99 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 193
$8F	P2275	Oxygen Sensor Minimum Oscillation Voltage	0 V	0.15100 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 193

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $21: Catalytic Converter Monitoring

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 21”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Catalytic converter monitoring Bank 1.	100%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 142 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $35: Camshaft Adjustment / IV V T Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	V V T specified position not reached.	-32 Deg. KW	28 Deg. KW	Refer to DTC P0011 in the DTC summary table. ⇒ page 64
$81	P000 A	V V T specified position is reached too slow.	-32 Deg	28 Deg. KW	Refer to DTC P000A in the DTC summary table. ⇒ page 62

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3A: Fuel Tank EVAP System Integrity/Leak Test (0.90”)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 3A”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0455	Tank leak test: Large leak.	950 Sec.	65.535 Sec	Refer to DTC P0455 in the DTC summary table. ⇒ page 148 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity/Leak Test (0.40/1.0mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 3B”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0442	Fuel Tank Leak Test: Small leak.	1.550 Sec.	65.535 Sec	Refer to DTC P0442 the DTC summary table. ⇒ page 146
$86 (2013 > MY)	P0442	Fuel Tank Leak Test: Small leak.	900 Pa	8191.75 Pa	Refer to DTC P0442 the DTC summary table. ⇒ page 146
$87 (2013 > MY)	P0442	Fuel Tank Leak Test: Long Cycle	0 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 146
$88 (2013 > MY)	P0442	Fuel Tank Leak Test: Short Cycle	0 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 146
$8B (2013 > MY)	P0441	Purge Valve Functional Check	0	19.98	Refer to DTC P0441 the DTC summary table. ⇒ page 145

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity/Leak Test (0.20/0.5mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 3C”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Tank leak test: Pinhole leak (0.5 mm).	4500 mSec.	65535 mSec	Refer to DTC P0456 in the DTC summary table. ⇒ page 148 .
$82	---	Evap system monitor OK by initial Purge Test	12 g	6553.5 g	Pass only.
$84 (2013 > MY)	P0456	Tank leak test: Very small leak	0.00000	0.17000	Refer to DTC P0456 in the DTC summary table. ⇒ page 148 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Valve Function Check

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 3D”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0441	Tank vent valve check from % DTEV: Active test Air balance at idle OK, (Normal operation and short test 70).	.350	1.999	Refer to DTC P0441 in the DTC summary table. ⇒ page 145 .
$82	—	Tank vent valve check from % DTEV: Active test, Oxygen sensor regulator deviating in lean direction (can only test OK), (Normal operation and short test 70).	1	65355	Pass only.
$88 (2012 > MY)	—	Purge flow OK by deviation lambda control.	1	65355	Pass only.
$8C (2013 > MY)	P0441	Purge flow monitor valve open	0.000000 mA	4.200 to 14.000 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 145 .
$8D (2013 > MY)	P0441	Purge flow monitor valve closed	0.00000 mA	4.300 to 36.3000 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 145 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic

repair procedure
⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen sensor heating between catalytic converter, diagnosis, Bank 1 Sensor 2 internal resistance test.	0 Ohms	4.56 k Ohms	Refer to DTC P0141 in the DTC summary table. ⇒ page 97 .
$85 (2012 > MY)	P0135	Oxygen sensor ceramic temp Bank 1 Sensor 1	715 °C	6513.5 °C	Refer to DTC P0135 in the DTC summary table. ⇒ page 85

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 42”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen sensor heating between catalytic converter, diagnosis, Bank 1 Sensor 2 internal resistance test.	0 Ohms	5.250 k Ohms	Refer to DTC P0141 in the DTC summary table. ⇒ page 97 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID 43: Oxygen Sensor Heater Monitor Bank 1 - Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141 or P0147 (2012 > MY)	Oxygen sensor heating between catalytic converter, diagnosis, Bank 1 Sensor 2 internal resistance test.	0 kOhms	4.560 kOhms	Refer to DTC P0141 in the DTC summary table. ⇒ page 97 . or DTC P0147 in the DTC summary table. ⇒ page 98

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Injection System

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID 42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Secondary air injection system function test.	.102 V	1.999 V	Refer to DTC P0491 in the DTC summary table.
$85	P0410	Secondary air injection pressure check.	0 kPa	5.000 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 139
$8A	P2440	Secondary air injection leak check.	0.00	1.289	Refer to DTC P2440 in the DTC summary table. ⇒ page 200
$8C (2013 > MY)	P2440	Tightness check Bank 1.	0.00	1.340	Refer to DTC P2440 in the DTC summary table. ⇒ page 200

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID A2”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0301	Misfire cylinder 1, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0301 in the DTC summary table. ⇒ page 121 .
$0C	P0301	Misfire cylinder 1, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0301 in the DTC summary table. ⇒ page 121 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6 Check test the results of components that are not continuously monitored”.

Select “Monitor-ID A3:”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0302	Misfire cylinder 2, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0302 in the DTC summary table. ⇒ page 123 .
$0C	P0302	Misfire cylinder 2, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0302 in the DTC summary table. ⇒ page 123 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID A4”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0303	Misfire cylinder 3, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0303 in the DTC summary table. ⇒ page 125 .
$0C	P0303	Misfire cylinder 3, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0303 in the DTC summary table. ⇒ page 125 .

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID A5”.

– Select the desired “Test-ID” .

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0304	Misfire cylinder 4, Average value over 10 Driving Cycles.	0 - 65535 (counts)	Refer to DTC P0304 in the DTC summary table. ⇒ page 127 .
$0C	P0304	Misfire cylinder 4, in this Driving Cycle.	0 - 65535 (counts)	Refer to DTC P0304 in the DTC summary table. ⇒ page 127 .

– Switch the ignition off.

– If any of the components or systems fail to meet the specified values, refer to Diagnostic Mode 03: Interrogating Fault Memory to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

3.3.7 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2015 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Mode 6: Check test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all“Test-IDs” that may be selected.

Monitor-ID (Hex-ID)	Component or System
$01: ⇒ page 34	Oxygen Sensor Monitor Bank 1 - Sensor 1
$02: ⇒ page 34	Oxygen Sensor Monitor Bank 1 - Sensor 2
$21: ⇒ page 35	Catalytic Converter Monitoring
$35: ⇒ page 35	Camshaft Adjustment / VVT Bank 1
$3B: ⇒ page 36	Fuel Tank EVAP System Integrity/Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 36	Fuel Tank EVAP System Integrity/Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 37	EVAP Valve Function Check
$41: ⇒ page 37	Oxygen Sensor Heater Monitor Bank 1 - Sensor 1
$42: ⇒ page 38	Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

Monitor-ID (Hex-ID)	Component or System
$71: ⇒ page 38	Secondary Air Injection System
$A2: ⇒ page 39	Mis-Fire Cylinder 1 Data
$A3: ⇒ page 39	Mis-Fire Cylinder 2 Data
$A4: ⇒ page 40	Mis-Fire Cylinder 3 Data
$A5: ⇒ page 40	Mis-Fire Cylinder 4 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 - Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $01 (01)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Response check bank 1 sensor 1.	0.0 V	1.0 V	Refer to DTC P0133 in the DTC summary table. ⇒ page 231
$86	P0133	Signal dynamic bank 1 sensor 1.	0.0 V	1.0 V	Refer to DTC P0133 in the DTC summary table. ⇒ page 231
$8A	P2195	Oxygen sensor lean fault detection bank 1 - sensor 1.	0.850	1.150	Refer to DTC P2195 in the DTC summary table. ⇒ page 354
$8B	P2196	Oxygen sensor rich fault detection bank 1 - sensor 1.	0.850	1.150	Refer to DTC P2196 in the DTC summary table. ⇒ page 356

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1- Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $02 (02)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P013A	Deceleration test - O2 transient time.	1,000 mV/sec.	65,534 mV/sec.	Refer to DTC P013A in the DTC summary table. ⇒ page 238

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$92	P013B	Output voltage rich during decel.	650 mV/sec.	65,534 mV/sec.	Refer to DTC P013B in the DTC summary table. ⇒ page 241
$93	P013E	Output voltage lean during accel.	0.5980 V	1.1306 V	Refer to DTC P013E in the DTC summary table. ⇒ page 244
$94	P013F	Deceleration test response time.	0.0 sec.	0.9 sec.	Refer to DTC P013F in the DTC summary table. ⇒ page 247
$95	P2270	Oxygen sensor maximum oscillation voltage.	0.874875 V	7.999857 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 371
$96	P2271	Oxygen sensor minimum oscillation voltage.	0.0 V	0.2498773 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 374

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $21: Catalytic Converter Monitoring

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $21 (21)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Catalytic converter monitoring bank 1.	0.0	1.0	Refer to DTC P0420 in the DTC summary table. ⇒ page 297

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $35: Camshaft Adjustment / IVVT Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $35 (35)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	V V T specified position not reached.	0.0° KW	9.0 to 10.0° KW	Refer to DTC P0011 in the DTC summary table. ⇒ page 208
$81	P000A	V V T specified position is reached too slow.	15.0°	655.35° KW	Refer to DTC P000A in the DTC summary table. ⇒ page 206

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity/Leak Test (0.040" / 1.0mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $3B (3B)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$87	P0442	Fuel tank leak test: long cycle (small leak).	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 303
$88	P0442	Fuel tank leak test: short cycle (small leak).	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 303

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity/Leak Test (0.020" / 0.5mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $3C (3C)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Tank leak test: pinhole leak (0.5 mm).	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0456 in the DTC summary table. ⇒ page 305

- If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .
- Switch the ignition off.

Monitor-ID $3D: EVAP Valve Function Check

- Connect the scan tool.
- Start the engine and run at idle.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $3D (3D)”.

- Select the desired “Test-ID (TID)” or “Hex-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8B	P0441	Tank vent valve check from % DTEV: active test air balance at idle ok, (normal operation and short test 70).	0.05	655.35	Refer to DTC P0441 in the DTC summary table. ⇒ page 301

- If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .
- Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 - Sensor 1

- Connect the scan tool.
- Start the engine and run at idle.
- Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $41 (41)”.

- Select the desired “Test-ID (TID)” or “Hex-ID”.
- Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen sensor ceramic temp bank 1 sensor 1.	730.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 236

- If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Mem-

ory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 - Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $42 (42)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$90	P0141	Oxygen sensor heating between catalytic converter, diagnosis, bank 1 sensor 2 internal resistance test.	0.0 kOhms	0.70 kOhms	Refer to DTC P0141 in the DTC summary table. ⇒ page 249

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure
⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Injection System

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $71 (71)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Secondary air injection system function test.	0.031 V	1.999 V	Refer to DTC P0491 in the DTC summary table. ⇒ page 307
$85	P0410	Secondary air injection pressure check.	-32.768 kPa	5.000 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 294
$8C	P2440	Tightness check bank 1.	0.00	1.499	Refer to DTC P2440 in the DTC summary table. ⇒ page 392

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $A2 (A2)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0301	Misfire cylinder 1, average value over 10 driving cycles.	0 to 65,535 (counts)	Refer to DTC P0301 in the DTC summary table. ⇒ page 273
$0C	P0301	Misfire cylinder 1, in this driving cycle.	0 to 65,535 (counts)	Refer to DTC P0301 in the DTC summary table. ⇒ page 273

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6 Check test the results of components that are not continuously monitored”.

Select “OBDMID $A3 (A3):”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0302	Misfire cylinder 2, average value over 10 driving cycles.	0 to 65,535 (counts)	Refer to DTC P0302 in the DTC summary table. ⇒ page 274
$0C	P0302	Misfire cylinder 2, in this driving cycle.	0 to 65,535 (counts)	Refer to DTC P0302 in the DTC summary table. ⇒ page 274

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $A4 (A4)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0303	Misfire cylinder 3, average value over 10 driving cycles.	0 to 65,535 (counts)	Refer to DTC P0303 in the DTC summary table. ⇒ page 276
$0C	P0303	Misfire cylinder 3, in this driving cycle.	0 to 65,535 (counts)	Refer to DTC P0303 in the DTC summary table. ⇒ page 276

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Mode 6: Check test the results of components that are not continuously monitored”.

Select “OBDMID $A5 (A5)”.

– Select the desired “Test-ID (TID)” or “Hex-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min./Max. Values	Additional Information
$0B	P0304	Misfire cylinder 4, average value over 10 driving cycles.	0 to 65,535 (counts)	Refer to DTC P0304 in the DTC summary table. ⇒ page 277
$0C	P0304	Misfire cylinder 4, in this driving cycle.	0 to 65,535 (counts)	Refer to DTC P0304 in the DTC summary table. ⇒ page 277

– Switch the ignition off.

– If any of the components or systems fail to meet the specified values, refer to Diagnostic Mode 03: Interrogating Fault Memory to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

3.3.8 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2016 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Mode 6: Check test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all“Test-IDs” that may be selected.

Monitor-ID (Hex-ID)	Component or System
$01: ⇒ page 42	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 42	Oxygen Sensor Monitor Bank 1 – Sensor 2
$21: ⇒ page 43	Catalytic Converter Monitoring
$35: ⇒ page 43	Camshaft Adjustment / V V T Bank 1
$3B: ⇒ page 44	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 44	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 45	EVAP Valve Function Check
$41: ⇒ page 45	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 46	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

Monitor-ID (Hex-ID)	Component or System
$71: ⇒ page 46	Secondary Air Injection System
$A2: ⇒ page 47	Mis-Fire Cylinder 1 Data
$A3: ⇒ page 47	Mis-Fire Cylinder 2 Data
$A4: ⇒ page 48	Mis-Fire Cylinder 3 Data
$A5: ⇒ page 48	Mis-Fire Cylinder 4 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 – Sensor 1.	0.0	1.0	Refer to DTC P0133 in the DTC summary table. ⇒ page 428
$86	P0133	Oxygen Sensor Signal Delay Bank 1 – Sensor 2.	0.0	1.0	Refer to DTC P0133 in the DTC summary table. ⇒ page 428
$8A	P2195	Oxygen Sensor Lean Fault Detection Bank 1 – Sensor 1.	0.850	1.150	Refer to DTC P2195 in the DTC summary table. ⇒ page 551
$8A	P2195	Oxygen Sensor Lean Fault Detection Bank 1 – Sensor 1.	0.850	32.767	Refer to DTC P2195 in the DTC summary table. ⇒ page 551
$8B	P2196	Oxygen Sensor Rich Fault Detection Bank 1 – Sensor 1.	0.850	1.150	Refer to DTC P2196 in the DTC summary table. ⇒ page 552
$8B	P2196	Oxygen Sensor Rich Fault Detection Bank 1 – Sensor 1.	0.850	32.767	Refer to DTC P2196 in the DTC summary table. ⇒ page 552

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P013A	Oxygen Sensor Transient Time Rich-Lean Bank 1 – Sensor 2.	1,000 mV/s	65,534 mV/s	Refer to DTC P013A in the DTC summary table. ⇒ page 435
$92	P013B	Oxygen Sensor Transient Time Lean-Rich Bank 1 – Sensor 2.	650 mV/s	65,534 mV/s	Refer to DTC P013B in the DTC summary table. ⇒ page 439
$93	P013E	Oxygen Sensor Delay Time Rich-Lean Bank 1 – Sensor 2.	0.0 s	0.9 s	Refer to DTC P013E in the DTC summary table. ⇒ page 443
$94	P013F	Oxygen Sensor Delay Time Lean-Rich Bank 1 – Sensor 2.	0.0 s	0.9 s	Refer to DTC P013F in the DTC summary table. ⇒ page 447
$95	P2270	Oxygen Sensor Maximum Oscillation Voltage Bank 1 – Sensor 2.	0.874875 V	7.999857 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 566
$96	P2271	Oxygen Sensor Minimum Oscillation Voltage Bank 1 – Sensor 2.	0.0 V	0.249877 3 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 570

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $21: Catalytic Converter Monitoring

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Measured OSC Compared To OSC Of Borderline Catalyst Bank 1.	0.0	0.9999811	Refer to DTC P0420 in the DTC summary table. ⇒ page 499

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $35: Camshaft Adjustment / V V T Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake.	0.0°	9.0 – 10.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 405
$81	P000A	Slow Response Intake.	15.0°	655.35°	Refer to DTC P000A in the DTC summary table. ⇒ page 403

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$87	P0442	Rough Leak Long Cycle.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 506
$88	P0442	Rough Leak Short Cycle.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 the DTC summary table. ⇒ page 506

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Small Leak.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0456 in the DTC summary table. ⇒ page 508

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Valve Function Check

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8B	P0441	Purge Valve Functional Check.	0.05	655.35	Refer to DTC P0441 in the DTC summary table. ⇒ page 504

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 – Sensor 1.	730.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 434

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$90	P0141	Oxygen Sensor Internal Resistance Bank 1 – Sensor 2.	0.0 kΩ	0.70 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 450

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Injection System

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Functional Check Blockage.	0.031	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 509
$82	P0491	Functional Check Leakage.	0.031	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 509
$82	P0491	Flow Check Blockage.	0.507	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 509
$82	P0491	Flow Check Leakage.	0.507	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 509
$85	P0410	Pressure Sensor Plausibility.	-32.768 kPa	5.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 496
$8C	P2440	Valve Tightness Check.	0.00	1.499	Refer to DTC P2440 in the DTC summary table. ⇒ page 590

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0301 in the DTC summary table. ⇒ page 477
$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0301 in the DTC summary table. ⇒ page 477

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6 Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0302 in the DTC summary table. ⇒ page 479
$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0302 in the DTC summary table. ⇒ page 479

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0303 in the DTC summary table. ⇒ page 481
$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0303 in the DTC summary table. ⇒ page 481

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0304 in the DTC summary table. ⇒ page 483
$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0304 in the DTC summary table. ⇒ page 483

– Switch the ignition off.

– If any of the components or systems fail to meet the specified values, refer to Diagnostic Mode 03: Interrogating Fault Memory to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

3.3.9 Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, 2017 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Mode 6: Check test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all“Test-IDs” that may be selected.

Monitor-ID (Hex-ID)	Component or System
$01: ⇒ page 50	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 50	Oxygen Sensor Monitor Bank 1 – Sensor 2
$21: ⇒ page 51	Catalytic Converter Monitoring
$35: ⇒ page 51	Camshaft Adjustment / V V T Bank 1
$3B: ⇒ page 52	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 52	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 53	EVAP Valve Function Check
$41: ⇒ page 53	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 54	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

Monitor-ID (Hex-ID)	Component or System
$71: ⇒ page 54	Secondary Air Injection System
$A2: ⇒ page 55	Mis-Fire Cylinder 1 Data
$A3: ⇒ page 55	Mis-Fire Cylinder 2 Data
$A4: ⇒ page 56	Mis-Fire Cylinder 3 Data
$A5: ⇒ page 56	Mis-Fire Cylinder 4 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 – Sensor 1.	0.0	1.0	Refer to DTC P0133 in the DTC summary table. ⇒ page 626
$86	P0133	Oxygen Sensor Signal Delay Bank 1 – Sensor 2.	0.0	1.0	Refer to DTC P0133 in the DTC summary table ⇒ page 626
$8A	P2195	Oxygen Sensor Lean Fault Detection Bank 1 – Sensor 1.	0.850	1.150	Refer to DTC P2195 in the DTC summary table. ⇒ page 757
$8A	P2195	Oxygen Sensor Lean Fault Detection Bank 1 – Sensor 1.	0.850	32.767	Refer to DTC P2195 in the DTC summary table. ⇒ page 757
$8B	P2196	Oxygen Sensor Rich Fault Detection Bank 1 – Sensor 1.	0.850	1.150	Refer to DTC P2196 in the DTC summary table. ⇒ page 758
$8B	P2196	Oxygen Sensor Rich Fault Detection Bank 1 – Sensor 1.	0.850	32.767	Refer to DTC P2196 in the DTC summary table. ⇒ page 758

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$05	P013A	Oxygen Sensor Transient Time Rich-Lean Bank 1 – Sensor 2.	1,000 mV/s	65,534 mV/s	Refer to DTC P013A in the DTC summary table. ⇒ page 633
$92	P013B	Oxygen Sensor Transient Time Lean-Rich Bank 1 – Sensor 2.	650 mV/s	65,534 mV/s	Refer to DTC P013B in the DTC summary table. ⇒ page 637
$93	P013E	Oxygen Sensor Delay Time Rich-Lean Bank 1 – Sensor 2.	0.0 s	0.9 s	Refer to DTC P013E in the DTC summary table. ⇒ page 641
$94	P013F	Oxygen Sensor Delay Time Lean-Rich Bank 1 – Sensor 2.	0.0 s	0.9 s	Refer to DTC P013F in the DTC summary table. ⇒ page 645
$95	P2270	Oxygen Sensor Maximum Oscillation Voltage Bank 1 – Sensor 2.	0.874875 V	7.999857 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 773
$96	P2271	Oxygen Sensor Minimum Oscillation Voltage Bank 1 – Sensor 2.	0.0 V	0.249877 3 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 777

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $21: Catalytic Converter Monitoring

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Measured OSC Compared To OSC Of Borderline Catalyst Bank 1.	0.0	0.999	Refer to DTC P0420 in the DTC summary table. ⇒ page 703

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $35: Camshaft Adjustment / V V T Bank 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake.	0.0°	9.0 – 10.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 601
$81	P000A	Slow Response Intake.	15.0°	655.35°	Refer to DTC P000A in the DTC summary table. ⇒ page 599

– If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ "3.3.3 Diagnostic Mode 03 - Read DTC Memory", page 20 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor-ID $3B".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$87	P0442	Rough Leak Long Cycle.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 in the DTC summary table. ⇒ page 710
$88	P0442	Rough Leak Short Cycle.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0442 in the DTC summary table. ⇒ page 710

– If any of components or systems fail to meet the specified values. Refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ "3.3.3 Diagnostic Mode 03 - Read DTC Memory", page 20 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 6: Check test the results of components that are not continuously monitored".

Select "Monitor-ID $3C".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Small Leak.	15.003 – 50.003 mA	255.996 mA	Refer to DTC P0456 in the DTC summary table ⇒ page 712

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Valve Function Check

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8B	P0441	Purge Valve Functional Check.	0.05	655.35	Refer to DTC P0441 in the DTC summary table. ⇒ page 708

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 – Sensor 1.	730.0° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 632

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$90	P0141	Oxygen Sensor Internal Resistance Bank 1 – Sensor 2.	0.0 kΩ	0.70 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 648

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Injection System

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Functional Check Blockage.	0.031	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 713
$82	P0491	Functional Check Leakage.	0.031	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 713
$82	P0491	Flow Check Blockage.	0.507	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 713
$82	P0491	Flow Check Leakage.	0.507	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 713
$85	P0410	Pressure Sensor Plausibility.	-32.768 kPa	5.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 700
$8C	P2440	Valve Tightness Check.	0.00	1.499	Refer to DTC P2440 in the DTC summary table. ⇒ page 797

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure

⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0301 in the DTC summary table. ⇒ page 677
$0C	P0301	Cylinder 1 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0301 in the DTC summary table. ⇒ page 677

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 6 Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Cylinder 2 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0302 in the DTC summary table. ⇒ page 678
$0C	P0302	Cylinder 2 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0302 in the DTC summary table. ⇒ page 678

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.
– Start the engine and run at idle.
– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.
– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Cylinder 3 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0303 in the DTC summary table. ⇒ page 680
$0C	P0303	Cylinder 3 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0303 in the DTC summary table. ⇒ page 680

– If any of components or systems fail to meet the specified values. Refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTC's or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .
– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.
– Start the engine and run at idle.
– Select “Diagnostic Mode 6: Check test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.
– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Cylinder 4 Data Averaged During Last 10 Driving Cycles, Only Indication (Pass).	0.0	65,535	Refer to DTC P0304 in the DTC summary table. ⇒ page 682
$0C	P0304	Cylinder 4 Data Current Driving Cycle, Only Indication (Pass).	0.0	65,535	Refer to DTC P0304 in the DTC summary table. ⇒ page 682

– Switch the ignition off.
– If any of the components or systems fail to meet the specified values, refer to Diagnostic Mode 03: Interrogating Fault Memory to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ “3.3.3 Diagnostic Mode 03 - Read DTC Memory”, page 20 .
– Switch the ignition off.

3.3.10 Diagnostic Mode 07 - Read Faults Detected During the Current or Last Driving Cycle

Mode 07 makes it possible to check emissions-related faults which appeared during the current or last driving cycle (pending DTCs).

A pending DTC is saved the first time a fault is detected (output via Mode 07).

– If the fault is detected again by the end of the following driving cycle, a confirmed DTC is entered (output via Mode 03) and the MIL is activated.

– If this malfunction is not detected again by the end of the following driving cycle, the corresponding pending code will be deleted at the end of the driving cycle.

Note

Depending on scan tool and protocol used, some of the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds. Do not switch the ignition off afterward.

– Select Mode 7: Check test results of components that are continuously monitored.

The number of pending DTCs or 0 malfunctions detected will be displayed on the scan tool screen.

– Refer to the following DTC tables for the diagnostic repair procedures.

♦ ⇒ “3.4 Engine DTC Tables”, page 61

♦ ⇒ “3.5 Transmission DTC Tables”, page 805

– Switch the ignition off.

3.3.11 Diagnostic Mode 08 - Request Control of On-Board System, Test or Component

Diagnostic Mode 08 is used to control the operation of an on-board system, test or component. A Mode 8 service can be used to turn on-board system ON or OFF, or to cycle an on-board system, test or component on or off for a specific period of time. The service can also be used to request system status or to report test results.

Test requirements

• No DTCs stored in the DTC memory.

• Intake Air Temperature (IAT) maximum 60° C.

• Coolant temperature 80 – 110° C.

- Throttle valve angle 12.0 – 16.0%.

Function test

Note

If the accelerator pedal is depressed during the test, the test will be aborted.

– Connect the scan tool.

– Start the engine and run at idle for at least 15 minutes.

– Select “Mode 8: Tank Leak Test”.

– Select “Test-ID 01: Tank Leak Test”.

– Check the specified value of the tank leak test at idle.

– The following will be displayed on the scan tool screen:

Tank leak test	Specified value
♦ Test function active ♦ Test function is being initiated, please wait ♦ Test off ♦ Test aborted	Test OK

– Switch the ignition off.

If the specified result is obtained:

System OK.

If the specified result is Not obtained:

– Repeat the tank leak test, switch the ignition off and start the engine again and let run for 15 minutes at idle.

– Switch the ignition off.

If the specified result is again Not obtained:

– A leak may be present. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 .

3.3.12 Diagnostic Mode 09 - Read Vehicle Information

Diagnostic Mode 09 makes it possible to access vehicle-specific information from the ECM and the TCM (where applicable).

Note

Depending on scan tool and protocol used, Diagnostic Mode 09 and the information provided may be referred to by a different name.

Test requirement

- No DTCs stored in the DTC memory.

Procedure

– Connect the scan tool.

– Switch the ignition on.

– Select Mode 09: Vehicle information.

– Select the desired Test-ID.

– The information requested will be displayed on the scan tool screen.

The following table is a numerical list of all Test-IDs that may be selected.

Test-ID	Diagnostic text
$02:	Vehicle identification number (VIN) e.g.
	♦ A different 17 digit number will be displayed for each vehicle
$04:	Calibration identification (ID) e.g.
	♦ Engine Control Module
	♦ Transmission Control Module
$06:	Calibration Verification Number (CVN) (check sum) e.g.
	♦ EC5AE460 the check sum is different for every control module version
	♦ 000D105
$08:	In-use Performance Tracking
$0A:	ECU Module Acronym And Text Name
	♦ Engine Control Module

– Switch the ignition off.

3.3.13 Diagnostic Mode 0A - Check Permanent DTC Memory

Note

♦ *The following is a generic explanation of the requirements, coverage, and operation of Mode 0A.*

♦ *Mode 0A may only be supported exclusively by OBD control modules in US vehicles. Mode 0A may not be supported in EOBD vehicles, meaning the control module may not send a response here.*

Mode 0A - Check Permanent DTC Memory (Request emissions-related diagnostic trouble codes with permanent status after code clear)

Permanent Fault Codes From MY 2010 with Phase-In conforming to CCR 1968.2 (d) (2.2.5): 50% from MY 2010 / 75% from MY 2011 / 100% from MY 2012 The vehicle only participates in Phase-In if all of the OBD-relevant control modules in the vehicle meet these requirements.

Mode 0A enables the request of all OBD-relevant faults with the status “Permanent Fault Code”

- Permanent Fault Codes are Confirmed Fault Codes that are currently activating the MIL. That means faults that are still displayed in Mode 03 but no longer activate the MIL (History Fault Codes) are not Permanent Fault Codes.

- Permanent Fault Codes are updated in Mode 0A at the same time as NVRAM storage immediately after switching the ignition off. A newly detected Permanent Fault Code is only visible after switching the ignition off/on in Mode 0A.

- Permanent Fault Codes may only be erased in the control module after they are corrected as long as the last diagnostic result was a PASS and the MIL is no longer activated by this fault. The Permanent Fault Codes should be erased from Mode 0A at the same time the MIL switches off when the ignition is switched off/on.

- Permanent Fault Codes may not be erased by clearing the DTC memory or disconnecting the power supply. Storage in NVRAM is required.

- Permanent Fault Codes may only be erased after clearing the DTC memory under the following conditions: - As long as no FAIL diagnostic result was detected for a Permanent Fault Code - and at least one PASS diagnostic result was detected - and the Minimum Trip Conditions for a General Denominator (without considering high/ambient temperature) were met in this phase in any DCY after erasing the DTC memory.

- The engine control module relays the message “Minimum Trip conditions met” to all other OBD control modules via CAN: CAN message OBD_01, Byte 8, Bit 4: OBD_Minimum_Trip

- Permanent Fault Codes may NOT be erased if the diagnostic result is FAIL after clearing the DTC memory. A Pending Fault Code should be stored and the DTC memory line should be overwritten with new Freeze Frame data. (Exception: If the Pending Fault Code is corrected without a Confirmed Fault Code being detected, the Permanent Fault Code may also be erased under the conditions described below.)

- Permanent Fault Codes should be erased in engine control modules after Update Programming. At this time, all readiness bits (Mode 01 PID $01) must be reset to “not complete” [(g)(4.4.6)(D)]. Permanent Fault Codes should not be erased in OBD control modules with Comprehensive Components (CCM) as a single readiness bit if the identical program/data status is being programmed. If a different program/data status is being programmed, Permanent Fault Codes should be erased after Update Programming.

- The procedure in Mode 01 through Mode 09 and in the service tester is NOT affected by implementation of the Permanent Fault Codes.

Note

After MIL off during the 40 warm-up cycle self-healing process, the fault may not be reported as Permanent Fault Code anymore

Procedure

♦ Erasing Permanent Fault Codes after code clear Service $0A – Permanent Fault Codes: can only be erased at the end of a driving cycle (during ECM keep alive time) if all the following conditions are fulfilled:

♦ ERASE: Permanent Fault Codes after code clear, the vehicle needs to be driven!

♦ NO FAIL: DTC cleared

♦ MONITORS: PASS

♦ MINIMUM: Conditions fulfilled 600.0 s (cumulative) Engine running

- DRIVE: 300.0 s (cumulative) vehicle speed > 25 mph (40 km/h)

3.4 Engine DTC Tables

- ⇒ “3.4.1 Engine Control Module , 2013 – 2014 MY”, page 62
- ⇒ “3.4.2 Engine Control Module , 2015 MY”, page 206
- ⇒ “3.4.3 Engine Control Module , 2016 MY”, page 403
- ⇒ “3.4.4 Engine Control Module , 2017 MY”, page 599

3.4.1 Engine Control Module , 2013 – 2014 MY

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A	Intake Camshaft Position Slow Response Bank 1	• adjustment angle >= 1.00; < 15.0° CRK	• modelled oil temperature -40...160 [°C] • engine speed 608...6016 [rpm] • set point change > 29.00 [°CRK] • time after set point change start >= 0.95...4.00 [s]	• 5.0...20.0 [s]	• 2 DCY	– Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010	Intake Camshaft Position Actuator Circuit Open Bank 1	• output voltage, lower range 1.85...2.28 [V] • output voltage, upper range (hardware values) 2.75...3.36 [V]	• actuator commanded off	• 2.0 s	• 2 DCY • continuous	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0011	Intake Camshaft Position Timing - Over-Advanced Bank 1	• camshaft position deviation > 10.00 [° CRK]	• modeled oil temperature -40...160 [°C] • engine speed 608...6016 rpm • camshaft adjustment n.a. • catalyst heating n.a.	• 9.0...35.0 [s]	• 2 DCY • multiple	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0016	Crankshaft Position – Camshaft Position Correlation	• adapted value for camshaft edges positions < -14.00; > 14.00 [° CRK]	• engine speed > 288; < 4000 [rpm] • modeled oil temperature > -15; < 160 [°C]	• 1428.75 [°CRK]	• 2 DCY • Continuous	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P0030	HO2S Heater Control Circuit Bank 1 Sensor 1	• O2S upstream heater voltage, lower range > 1.85...2.28 [V] • and • O2S upstream heater voltage, upper range < 2.75...3.36 [V] • (hardware values)	• engine start not active	• 2.5 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0031	HO2S Heater Control Circuit Low Bank 1 Sensor 1	• O2S upstream heater voltage > 1.85...2.28 [V]	• engine start not active	• 2.5 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 .
P0032	HO2S Heater Control Circuit High Bank 1 Sensor 1	• O2S upstream heater driver temperature > 155.0...185.0 [°C] • OR • O2S upstream heater driver output current (hardware values) > 8.0...11.0 [A]	• engine start not active	• 2.5 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 .
P0036	HO2S Heater Control Circuit Bank 1 Sensor 2	• voltage, lower range > 1.85...2.28 [V] • and • voltage, upper range < 2.75...3.36 [V]	• engine start not active	• 5.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .
P0037	HO2S Heater Control Circuit Low Bank 1 Sensor 2	• output voltage < 1.85...2.28 [V]	• engine start not active	• 5.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0038	HO2S Heater Control Circuit High Bank 1 Sensor 2	• temperature in powerstage > 155.0...185.0 [°C] • or • output current > 8.0...11.0 A	• engine start not active	• 5.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0045	Turbocharger Boost Pressure Control Valve open circuit	• bypass valve driver load resistance > 200 kOhm	• deviation between actual and filtered boost pressure actuator position <= 5.00 [%] • boost pressure actuator controller not active • time delay > 1.0 [s]	• 0.2 s	• 2 DCY • Continuous	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0068	MAF vs Throttle Position Correlation	• deviation of manifold pressure from setpoint < -15.00...-10.00 [kPa] • deviation throttle area controller < -43.00 [%] • and • correction value (lambda controller and fuel trim) -28.00...28.00 [%]	• engine running • time after engine start > 5.0 [s] • barometric pressure 73.00...105.00 [kPa] • engine speed 512...3000 [rpm] • IAT > -48 [°C] • ECT > -48 [°C] • dynamic engine speed < | 8160 | [rpm] • dynamic air mass flow setpoint < | 25.01 | [mg/rev] • throttle actuator commanded on • pressure ratio @ throttle 0.10...0.60 [-] • throttle adaption not active • gradient intake manifold pressure <= 199.90; >= -199.90 [kPa/s] • vehicle speed <= 2 [km/h] • throttle position 0.00...100.00 [%] • engine speed 576...3008 [rpm • modeled pressure quotient 0.27...0.60 [-] • time after engine start > 5.0 [s] • barometric pressure 73.00...107.50 kPa • lambda control closed loop • barometric pressure valid	• 5.0 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0070	Ambient Air Temperature Sensor Circuit	• AAT sensor voltage > 4.50 [V]		• 2.0 s	• 2 DCY • Continuous	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0071	Ambient Air Temperature Sensor Range/Performance	• diff. AAT vs. IAT @ first engine start (depending on engine off time) > |20| [K] • and • diff. AAT vs. ROT @ first engine start (depending on engine off time) > |20| [K] • and • diff. IAT vs. ROT @ first engine start (depending on engine off time) < |20| [K]	• engine off time > 360.00 [min] • decrement check to ensure an cold vehicle state: • diff. IAT vs. min. IAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. ROT vs. min. ROT @ condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. AAT vs. min. AAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s]	• 100 s	• 2 DCY • Once/ DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0072	Ambient Air Temperature Sensor Circuit Low	• AAT sensor voltage < 0.10 [V]		• 2.0 s	• 2 DCY • Continuous	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0087	Fuel Rail/ System Pressure - Too Low	• deviation between fuel pressure setpoint and current fuel pressure > 2000.10 [kPa] • and • fuel pressure < 2500.00 [kPa] • case: 1 • fuel mass controller output -50.00...50.00 [%] • high pressure controller output > 30 [mg] • case 2: • fuel pump at max limit • mass fuel flow setpoint n.a. • fuel pressure n.a.	• engine speed 608...6816 [rpm] • mass fuel flow setpoint 0.01...1.39 [g/rev] • for time >= 1.0 [s] • engine start not active • time after engine start > 5.0 [s] • engine warm-up n.a. • catalyst heating not active • full load n.a. • component protection n.a. • catalyst purge n.a. • lambda control n.a. • evap purge functionality diagnosis n.a. • canister load <= n.a. [-] • or • evap purge valve n.a.	• 2.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0106	Manifold Pressure Sensor rationality check @ engine off	• difference between barometric and intake manifold pressure >= | 7.50 | [kPa] AND • difference between boost and intake manifold pressure >= | 7.50 | [kPa] • intake manifold pressure @ engine off n.a.	• conditions @ stop cycle: • for time >= 10.0 [s] • delay after engine stop 5.0 [s] • vehicle speed < 1 [km/h] • conditions else: • delay after engine stop 5.0 [s] • vehicle speed < 1 [km/h]	• 3.0 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
	Manifold Pressure Sensor rationality check @ power latch phase	• difference between boost and intake manifold pressure >= | 7.50 | [kPa] • and • intake manifold pressure difference between engine during power latch phase and idle speed n.a. • difference between barometric and intake manifold pressure >= | 7.50 | [kPa] • and • intake manifold pressure difference between engine during power latch phase and idle speed n.a. • intake manifold pressure @ power latch phase n.a.	• vehicle speed < 1 [km/h] • delay time in power latch phase > 10.0 [s] • delay after engine stop 5.0 [s] • barometric pressure sensor voltage 0.20...4.80 [V] • intake manifold pressure sensor voltage 0.20...4.80 [V] • boost pressure sensor voltage. 0.20...4.80 [V]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air System rationality check high	• deviation throttle area controller > 45.00 [%] • and • filtered lambda controller correction < -28.00 [%]	• throttle position 0.000...100.003 [° TPS] • engine speed 576...3008 [rpm] • pressure quotient at throttle 0.27...0.60 [-] • throttle actuator commanded on • time after engine start > 5.0 [s] • boost pressure < 135.00 [kPa] • barometric pressure 73.00...107.50 kPa • fuel-fed overrun not active • fuel cut off not active	• 5.0 s		
	Intake Air System rationality check low	• deviation throttle area controller < -100.00...-45.00 [%] • and • filtered lambda controller correction > 28.00 [%]		• 5.0 s		

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0107	Manifold Pressure Sensor short to ground	• intake manifold pressure sensor voltage < 0.20 [V]		• 0.5 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
P0108	Manifold Pressure Sensor short to battery plus	• intake manifold pressure sensor voltage > 4.80 [V]		• 0.5 s	• 2 DCY • Continuous	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	• diff. IAT vs. AAT @ first engine start (depending on engine off time) > |20| [K] • and • diff. IAT vs. ROT @ first engine start (depending on engine off time) > |20| [K] • and • diff. AAT vs. ROT @ first engine start (depending on engine off time) < |20| [K]	• engine off time > 360.00 [min] • decrement check to ensure an cold vehicle state: • diff. IAT vs. min. IAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. ROT vs. min. ROT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. AAT vs. min. AAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s]	• 100.0 s	• 2 DCY • Once/ DCY	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 .
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	• IAT sensor voltage < 0.10 [V]		• 2.0 s	• 2 DCY • Continuous	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0113	Intake Air Temperature Sensor 1 Circuit High Input	• IAT sensor voltage > 4.50 [V]		• 2.0 s	• 2 DCY • Continuous	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	• diff. max. ECT vs. min. ECT < 1.5 [K]	• ECT range conditions • ECT @ start < 82; > 90 [°C] • and • ECT @ start n.a. • driving condition H: • engine part load • or • engine full load • engine speed > 1300 [rpm] • vehicle speed > 50 [km/h] • ratio air mass flow to max. air mass flow > 6.0 [%] • time after conditions are fulfilled > 30...60 [s] • driving condition L: • engine idle vehicle speed n.a. • or • fuel cut off active • time after conditions are fulfilled > 30...60 [s]	• 120.0 s	• 2 DCY • Once/ DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• diff. reference model temperature vs. measured egine coolant temperature > 10 [K]		• 10.0 s		
		• diff. ECT @ start vs. min. temperature from cross check < 10.0 [K]	• cross check finished	• 100.0 s		
		• ECT @ start > 32...80 [°C]	• engine off time > 240.00 [min	• 100.0 s		
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	• ECT sensor voltage < 0.30 [V]		0.5 s	• 2 DCY • Continuous	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0118	Engine Coolant Temperature Sensor 1 Circuit High Input	• ECT sensor voltage > 4.90 [V]	• IAT at throttle >= -33 [°C] • time after engine start > 60.0 [s]	0.5 s	• 2 DCY • Continuous	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P0121	Accelerator Pedal Position Sensor 1/ Accelerator Pedal Position Sensor 2 Circuit Range/Performance	• normalised difference between measured and modeled value of mass air flow from TPS 1 >= 1.00 [-] • or • relative mass air flow integral from TPS 1 > 60.00 [-]	• throttle adaption not active	• 0.01 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
		• difference between TPS 1 and TPS 2 > | 6.499 | [°TPS]		• 0.3 s		
P0122	Accelerator Pedal Position Sensor 1/ Accelerator Pedal Position Sensor 2 Circuit Low Input	• throttle position sensor 1 voltage < 0.15 [V]		• 0.1 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123	Accelerator Pedal Position Sensor 1/ Accelerator Pedal Position Sensor 2 Circuit High Input	• throttle position sensor 1 voltage > 4.85 [V]		• 0.1 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0131	O2 Sensor Circuit, Bank 1 Sensor 1 Low Voltage	• pump cell, virtual ground, resistance pin voltage, nernst cell pin voltage < 0.0686...0.1836 [V]	• engine start not active	• 0.5 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0132	O2 Sensor Circuit, Bank 1 Sensor 1 High Voltage	• pump cell, virtual ground, resistance pin voltage > 5.39...6.018 [V] • OR • nernst cell pin voltage > 6.076...6.783 [V]	• engine start not active	• 0.5 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133	Oxygen Sensors front Dynamic Path response check	• average check • mean value of normalised signal amplitude >= 0.80 [-] Or • ratio check • ratio of failed diagnostic cycle > n.a. [-]	• CONDITIONS RANGE 1: • (standard parameters) • general conditions • time after engine start n.a. • ECT >= -48 [°C] • vehicle speed n.a. • waiting for MAF integral is flown off after gear is changed n.a. • MAF 0.00...1389.00 [mg/rev] • integrated MAF in catalyst per cylinder n.a. • static conditions • O2S front ready • lambda stimulation active • lambda control value -35.00...35.00 [%] • engine speed 928...3008 [rpm] • MAF to activate diagnosis function 150.00...600.00 [mg/rev] • MAF per segment > 18.00 [kg/h] • normalized integrated fuel mass in oil n.a. • catalyst purge not active • limited dynamic conditions • integrated MAF after dynamic conditions are fulfilled < n.a. [g] • dynamic engine speed < | 150 | [rpm] • dynamic MAF < | n.a. | [mg/rev]	• 4.4 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• or • dynamic MAF per segment < | 30.00 | [kg/h] • dynamic lambda < n.a. [%] • change of dynamic torque < | 0.07 | [-] • CONDITIONS RANGE 2: • (diagnosis carried out together with the catalyst efficiency diagnosis) • general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < | 0.08...0.15| [-] • or • counter lambda controller deviation > 1.00 [-] • quickpass trim control ready • or			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• trim control with high demand of adaptation proportional part of trim control < | 0.25 | [-] • lambda adaptation commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C] • modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • integrated MAF, catalyst temp. conditions fulfilled n.a. • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk] • integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions • canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a.			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors front Delay Path response check	• normalised lambda controller value vs. modeled lambda value >= 0.80 -	• general conditions • O2S front ready • time after engine start n.a. • MAF to activate diagnosis function n.a. • integrated MAF per cylinder >= 0.42...2.00 [kg] • vehicle speed n.a. • static condition • engine speed 1056...3008 [rpm] • MAF per cylinder 18.00...150.00 [kg/h] • vehicle speed n.a. • dynamic conditions • dynamic engine speed < | 288 | [rpm] • dynamic torque < | 80.00 | [Nm] • absolute dynamic MAF < | 70.00 | [kg/h] • activation due to canister purge • canister purge no purge • or • canister purge not active • or • canister purge wait ramp open • or • canister purge min purge • and • canister load known • or • canister purge n.a. • and			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• moving mean value canister load <= 1.80 [-]			
P0135	O2 Heater Circuit Bank 1 Sensor 1	• O2S ceramic temp. < 730; >= 6514 [°C] • error counter > 800.00 [-]	• engine stop not active • O2S front ready • O2S heater front active • EGT @ O2S front n.a. • time delay >= 2.0 [s]	• 40.0 s • 0.1 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0137	O2 Circuit Low Voltage Bank 1 Sensor 2	• O2S rear voltage < 0.06 [V] • internal resistance O2S rear < 40.00 [Ohm	• catalyst purge not active • engine start not active • mass air flow n.a. • lambda control active	• 23.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0138	O2 Circuit High Voltage Bank 1 Sensor 2	• O2S rear voltage > 2.50 [V]		• 5.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0139	O2 Circuit Slow Response Bank 1 Sensor 2	• EWMA filtered transient time at fuel cutoff > 0.0 s • In voltage range of 201 - 401.0 mV • Number of checks, >= 3	• Rich voltage enable > = 547.9 mV • Lean voltage < = 201.2 mV • Fuel cutoff active • O2S rear ready • Modeled exhaust gas temp > 400° C • Front O2 sensor lambda signal > 2.00 V	• 100.0 s	• 1 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013A	O2 Sensor Slow Response Rich to Lean Bank 1 Sensor 2	• gradient sensor voltage < 1000.00 [mV/s]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 [kJ] • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < | 0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • number of checks 2.00 [-] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C]	• 86.5 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013B	Oxygen Sensors rear lean to rich transition response check	• gradient sensor voltage < 650.00 [mV/s]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 [kJ] • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < | 0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • number of checks 2.00 [-] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C]	• 86.5 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions • canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E	Oxygen Sensors rear rich to lean transition delayed response monitoring, delay measurement	• sensor signal delay time > 0.9 [s]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 [kJ] • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < | 0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • number of checks 2.00 [-] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C]	• 86.5 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions • canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013F	Oxygen Sensors rear lean to rich transition delayed response monitoring, delay measurement	• sensor signal delay time > 0.9 [s]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 [kJ] • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < |0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • number of checks 2.00 [-] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C]	• 86.5 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions • canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P0140	O2 Circuit No Activity Detected Bank 1 Sensor 2	• O2S rear voltage 1.30...2.50 [V] • internal resistance O2S rear > 65534.00 [Ohm	• engine start not active • O2S rear ready • exhaust gas temperature at O2S rear n.a. • O2S heater rear active	• 23.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0141	O2 Heater Circuit Bank 1 Sensor 2	• internal resistance O2S rear > 700 Ω	• O2S heater rear active • engine stop • ignition on • O2S rear ready • O2S rear heater control 0.00...99.61 [%] • exhaust gas temperature at O2S rear <= 1775 [°C] • ECT >= -48 [°C]	13.8 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0145	O2 Sensor Circuit Slow Response Bank 1 Sensor 3	• EWMA filtered transient time at fuel cutoff > 1.2 s • In voltage range of 201.2 – 401.4 mV • Number of checks, 3	• Rich voltage enable > = 548.0 mV • Lean voltage < = 201.2 mV • Fuel cutoff active • O2S rear ready • Modeled exhaust gas temp > 400° C • Front O2 sensor lambda signal > 2.0 V	100.0 s	• 2 DCY	– Refers to vehicles with 3 oxygen sensor systems only.
P0146	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	• Signal voltage 0.40 – 0.60 V for > 3.0 s • Internal resistance > 40,000 Ω	Cold condition • Sensor voltage <= 0.40 V or 0.50 – 1.08 V • Modeled exhaust gas temp. 650° C for > 18.0 s • Heater power >= 50% for > 10.0 s	38.0 s	• 2 DCY	– Refers to vehicles with 3 oxygen sensor systems only.
P0147	O2 Sensor Heater Circuit Bank 1 Sensor 3	• Heater (ECM internal) resistance 792 – 4,560 Ω	• Modeled exhaust gas temp 250 – 650° C • Engine shutoff time > 60.0 s • Fuel cutoff not active • Number of checks 10 • Heater commanded on	15.0 s	• 2 DCY	– Refers to vehicles with 3 oxygen sensor systems only.
P0149	Injection Valves Supply Voltage out of range low / high	• boost voltage < 30.00 [V] • boost voltage <= 50.00 [V] • boost voltage > 75.00 [V]	• engine running >= 0.3 [s]	• 3.6 [s]	• 2 DCY • Continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171	System Too Lean Bank 1	• lambda controller output > 35.00 [%]	• general: • lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] • engine speed > 576 [rpm] • ECT @ cylinder block > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C]	• 60.0 s	• 2 DCY • Continuous	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 . – Check the Oxygen Sen-

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						sor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172	System Too Rich Bank 1	• lambda controller output < -35.00 [%]	• general: • lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] • engine speed > 576 [rpm] • ECT @ cylinder block > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C] • oil dilution not detected	• 60.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Testing", page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
P0190	Fuel Rail Pressure Sensor Circuit	Signal voltage > 4.8 V		0.5 s	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance	Actual pressure > 20.6 MPa	• Time after engine start > 0.0 s • Engine speed > 90 RPM	3.0 s	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .
P0192	Fuel Rail Pressure Sensor Circuit Low Input	Signal voltage < 0.2 V		0.5 s	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0201	Injector Circuit electrical error Cylinder 1	• indeterminate fault pattern via powerstage diagnosis detected • and • injector low side voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector high side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 [rpm] • injection time n.a.	• 8640.00 [°CRK]	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• injector low side switch current > 25.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm] • injector high side switch current > 25.0 [A] • injector current rise time during peak phase < 0.064 ms				
	Injector Circuit Open Cylinder 1	• fault pattern for open circuit via powerstage diagnosis detected • injector low side voltage				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0202	Injector Circuit electrical error Cylinder 2	• indeterminate fault pattern via power-stage diagnosis detected • and • injector low side voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector high side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 [rpm] • injection time n.a.	• 8640.00 [°CRK]	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• injector low side switch current > 25.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm] • injector high side switch current > 25.0 [A] • injector current rise time during peak phase < 0.064 ms				
	Injector Circuit Open Cylinder 2	• fault pattern for open circuit via powerstage diagnosis detected • injector low side voltage				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0203	Injector Circuit electrical error Cylinder 3	• indeterminate fault pattern via power-stage diagnosis detected • and • injector low side voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector high side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 [rpm] • injection time n.a.	• 8640.00 [°CRK]	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• injector low side switch current > 25.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm] • injector high side switch current > 25.0 [A] • injector current rise time during peak phase < 0.064 ms				
	Injector Circuit Open Cylinder 3	• fault pattern for open circuit via powerstage diagnosis detected • injector low side voltage				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204	Injector Circuit electrical error Cylinder 4	• indeterminate fault pattern via power-stage diagnosis detected • and • injector low side voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector high side switch current > 25.0 [A] • or • injector low side voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current > 25.0 [A] • or • injector voltage < 2.0 [V] • injector low side switch current (hardware values) > 9.0...14.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 [rpm] • injection time n.a.	• 8640.00 [°CRK]	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• injector low side switch current > 25.0 [A] • or • injector load resistance to ground and battery > 20.0 [Ohm] • injector high side switch current > 25.0 [A] • injector current rise time during peak phase < 0.064 ms				
	Injector Circuit Open Cylinder 4	• fault pattern for open circuit via powerstage diagnosis detected • injector low side voltage				
P0221	Accelerator Pedal Position Sensor 1 / Accelerator Pedal Position Sensor 2 Circuit Range/Performance	• normalised difference between measured and modeled value of mass air flow from TPS 2 >= 1.00 [-] • or • relative mass air flow integral from TPS 2 > 60.00 [-]	• throttle adaption not active	• 0.01 [s]	• 2 DCY • continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P0222	Accelerator Pedal Position Sensor 1 / Accelerator Pedal Position Sensor 2 Circuit Low Input	• throttle position sensor 2 voltage < 0.15 [V]		• 0.1 s	• 2 DCY • continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0223	Accelerator Pedal Position Sensor 1 / Accelerator Pedal Position Sensor 2 Circuit High Input	• throttle position sensor 2 voltage > 4.85 [V]		• 0.1 s	• 2 DCY • continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0236	Turbocharger Boost Pressure Sensor rationality check @ engine off	• difference between barometric and boost pressure >= | 7.50 | [kPa] • and • difference between intake manifold and boost pressure >= | 7.50 | [kPa]	• conditions @ stop cycle: • for time >= 10.0 [s] • delay after engine stop 5.0 [s] • vehicle speed < 1 [km/h] • conditions else: • delay after engine stop 5.0 [s] • vehicle speed < 1 [km/h]	• 3.0 s	• 2 DCY • Continuous	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
	Turbocharger Boost Pressure Sensor rationality check @ power latch phase	• difference between intake manifold and boost pressure >= | 7.50 | [kPa] • and • intake manifold pressure difference between power latch phase and idle speed n.a.	• vehicle speed < 1 [km/h] • delay time in power latch phase > 10.0 [s] • delay after engine stop 5.0 [s] • barometric pressure sensor voltage 0.20...4.80 [V] • intake manifold pressure sensor voltage 0.20...4.80 [V] • boost pressure sensor voltage 0.20...4.80 [V]			
		• difference between barometric and boost pressure >= | 7.50 | [kPa] • and • boost pressure difference between full load and power latch phase < 50.00 [kPa]				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0237	Turbocharger Boost Sensor Circuit Low	• turbocharger boost pressure sensor voltage < 0.20 [V]		• 0.5 s	• 2 DCY • Continuous	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0238	Turbocharger Boost Sensor Circuit High	• turbocharger boost pressure sensor voltage > 4.80 [V]		• 0.5 s	• 2 DCY • Continuous	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P025A	Fuel Pump Module Control Circuit Open	Signal voltage 4.40 – 5.60 V	Engine speed > 80 RPM	0.5 s	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P025C	Fuel Pump Module Control Circuit Low	Signal voltage 2.15 – 3.25 V	Engine speed > 80 RPM	0.5 s	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .
P025D	Fuel Pump Module Control Circuit High	Signal current > 1.10 A	Engine speed > 80 RPM	0.5 s	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .
P0261	Cylinder 1 Injector Circuit Low	• fault pattern for short to ground via powerstage diagnosis detected • injector voltage < 2.0 [V] • injector driver voltage < 2 [V] • AND • injector driver high side switch current > 25 A • injector driver voltage < 2 [V] • AND • injector driver high side switch current < 25A • AND • injector driver low side switch current < 25A	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0262	Cylinder 1 Injector Circuit High	• fault pattern for short to battery plus via powerstage diagnosis detected • injector voltage > 2.0 [V] • injector driver voltage > 2.0 [V] • AND • injector driver high side switch current > 25 [A] • injector driver voltage > 2.0 [V] • AND • injector driver low side switch current > 25 [A]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0264	Cylinder 2 Injector Circuit Low	• fault pattern for short to ground via powerstage diagnosis detected • injector voltage < 2.0 [V] • injector driver voltage < 2 [V] • AND • injector driver high side switch current > 25 A • injector driver voltage < 2 [V] • AND • injector driver high side switch current < 25A • AND • injector driver low side switch current < 25A	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0265	Cylinder 2 Injector Circuit High	• fault pattern for short to battery plus via powerstage diagnosis detected • injector voltage > 2.0 [V] • injector driver voltage > 2.0 [V] • AND • injector driver high side switch current > 25 [A] • injector driver voltage > 2.0 [V] • AND • injector driver low side switch current > 25 [A]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0267	Cylinder 3 Injector Circuit Low	• fault pattern for short to ground via powerstage diagnosis detected • injector voltage < 2.0 [V] • injector driver voltage < 2 [V] • AND • injector driver high side switch current > 25 A • injector driver voltage < 2 [V] • AND • injector driver high side switch current < 25A • AND • injector driver low side switch current < 25A	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0268	Cylinder 3 Injector Circuit High	• fault pattern for short to battery plus via powerstage diagnosis detected • injector voltage > 2.0 [V] • injector driver voltage > 2.0 [V] • AND • injector driver high side switch current > 25 [A] • injector driver voltage > 2.0 [V] • AND • injector driver low side switch current > 25 [A]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0270	Cylinder 4 Injector Circuit Low	• fault pattern for short to ground via powerstage diagnosis detected • injector voltage < 2.0 [V] • injector driver voltage < 2 [V] • AND • injector driver high side switch current > 25 A • injector driver voltage < 2 [V] • AND • injector driver high side switch current < 25A • AND • injector driver low side switch current < 25A	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0271	Cylinder 4 Injector Circuit High	• fault pattern for short to battery plus via power-stage diagnosis detected • injector voltage > 2.0 [V] • injector driver voltage > 2.0 [V] • AND • injector driver high side switch current > 25 [A] • injector driver voltage > 2.0 [V] • AND • injector driver low side switch current > 25 [A]	• engine stop not active • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a. • engine running • ECT >= -30 [°C] • engine speed < 7000 rpm • injection time n.a.	• 8640.00 [°CRK] • 720 ° CRK	• 2 DCY • continuous	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0300	Random Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% – 20%	• Time from start, 0.0 s • IAT, > -48° C • Time after engine start, Idle +/- 150 RPM and 1 cam rev. • Engine torque, > 5.47 – 23.4% • Camshaft revolutions 1 • Engine speed range, 440 – 6,800 RPM • Fuel cutoff, Not active • ECT at start, > -48° C	• 1,000 Rev. • 200 Rev.	• 2 DCY • Immediate	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301	Cylinder 1 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% – 20%	• Time from start, 0.0 s • IAT, > -48° C • Time after engine start, Idle +/- 150 RPM and 1 cam rev. • Engine torque, > 5.47 – 23.4% • Camshaft revolutions 1 • Engine speed range, 440 – 6,800 RPM • Fuel cutoff, Not active • ECT at start, > -48° C	• 1,000 Rev. • 200 Rev.	• 2 DCY • Immed.	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0302	Cylinder 2 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% – 20%	• Time from start, 0.0 s • IAT, > -48° C • Time after engine start, Idle +/- 150 RPM and 1 cam rev. • Engine torque, > 5.47 – 23.4% • Camshaft revolutions 1 • Engine speed range, 440 – 6,800 RPM • Fuel cutoff, Not active • ECT at start, > -48° C	• 1,000 Rev. • 200 Rev.	• 2 DCY • Immed.	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0303	Cylinder 3 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% – 20%	• Time from start, 0.0 s • IAT, > -48° C • Time after engine start, Idle +/- 150 RPM and 1 cam rev. • Engine torque, > 5.47 – 23.4% • Camshaft revolutions 1 • Engine speed range, 440 – 6,800 RPM • Fuel cutoff, Not active • ECT at start, > -48° C	• 1,000 Rev. • 200 Rev.	• 2 DCY • Immed.	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0304	Cylinder 4 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% – 20%	• Time from start, 0.0 s • IAT, > -48° C • Time after engine start, Idle – 150 RPM • Engine torque, > 5.47 – 23.4% • Camshaft revolutions 1 • Engine speed range, 480 – 6,800 RPM • Fuel cutoff, Not active • ECT at start, > -10.50° C	• 1,000 Rev. • 200 Rev.	• 2 DCY • Immed.	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0326	Knock Sensor rationality check low	• difference between knock sensor signal and average knock sensor signal < 0.00...0.12 [V]	• ECT > 65 [°C] • MAF > 229.00 [mg/stk]	• 4.3 s	• 2 DCY • Continuous	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0327	Knock Sensor 1 Circuit Low	• sensor signal < 0.26...0.31 [V]	• ECT > 65 [°C] • MAF > 229.00 [mg/stk] • Engine speed, > 2016 RPM	• 4.0 s	• 2 DCY • Continuous	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0335	Crankshaft Position Sensor CPDD - Crankshaft Position and Direction Determination out of range	• pulse width backwards < 62; > 150 [µs] • for number of pulse widths outside tolerance > 1.00 [-] • or • pulse width forwards < 15; > 62 [µs] • for number of pulse widths outside tolerance > 1.00 [-]	• engine speed > 32; < 1200 [rpm]	• 1800.00 [°CRK]	• 2 DCY • Continuous	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Crankshaft Position Sensor activity check	• counted intake camshaft signals without synchronisation >= 17.00 [-] • or • counted exhaust camshaft signals without synchronisation >= n.a. [-]	• engine cranking	• 0.01 s		

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0336	Crankshaft Position Sensor loss of synchronization rationality check	• crankshaft synchronization lost	• engine running	• 2160.00 [°CRK]	• 2 DCY • Continuous	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Crankshaft Position Sensor tooth number rationality check	• one or two additional teeth recognized incorrect • or • one or two teeth missed	• Engine speed > 320 [rpm]	• 1800.00 [°CRK]		
	Crankshaft Position Sensor tooth period rationality check	• sensor signal < 50...156 [µs] • and • engine speed > 1200 [rpm] • or • sensor signal < 30 [µs] • and • engine speed <= 1200 [rpm	• engine running	• 45720.00 [°CRK]		
	Crankshaft Position Sensor segment monitoring out of range	• segment adaptation >= | 7.00 | [%]	• fuel cut off all cylinders active • segments in fuel cut-off mode >= 32.00 [-]	• 900.00 [°CRK]		
P0340	Camshaft Position Sensor Circuit	• signal change not detected • for number of reference gap >= 3.00 [-]	• Engine speed > 32 [rpm]	• 2520 [° CRK]	• 2 DCY • continuous	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0341	Camshaft Position Sensor rationality check	• segment period ratio factor < 0.36; > 2.75 [-] • or • offset between camshaft and crankshaft < -79.00; > 15.00 [°CRK]	• Engine speed > 32; < 8160 [rpm]	• 952.50 [°CRK]	• 2 DCY • continuous	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Camshaft Position Sensor angular offset check	• offset between camshaft and crankshaft < -79.00; > 15.00 [°CRK]	• Engine speed > 32 rpm	• 450.00 [°CRK]	• 2 DCY • Once/ DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869
	Camshaft Position Sensor signal activity check	• segment time value < 50 [µs]	• Engine speed > 32; < 8160 [rpm]	• 1440.00 [°CRK]	• 2 DCY • continuous	
P0351	Ignition Coil A Primary Circuit	• output current in ON state < 0.05...0.2 [mA] • (hardware values) • output current in ON state > 40...125 [mA] • (hardware values) • output current in OFF state >= 40...100 [mA] • (hardware values)	• Engine speed > 512 RPM • ECT > -30 [°C] • engine stop not active	• 0.8 s	• Continuous • 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0352	Ignition Coil B Primary Circuit	• output current in ON state < 0.05...0.2 [mA] • (hardware values) • output current in ON state > 40...125 [mA] • (hardware values) • output current in OFF state >= 40...100 [mA] • (hardware values)	• Engine speed > 512 RPM • ECT > -30 [°C] • engine stop not active	• 0.8 s	• Continuous • 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0353	Ignition Coil C Primary Circuit	• output current in ON state < 0.05...0.2 [mA] • (hardware values) • output current in ON state > 40...125 [mA] • (hardware values) • output current in OFF state >= 40...100 [mA] • (hardware values)	• Engine speed > 512 RPM • ECT > -30 [°C] • engine stop not active	• 0.8 s	• Continuous • 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0354	Ignition Coil D Primary Circuit	• output current in ON state < 0.05...0.2 [mA] • (hardware values) • output current in ON state > 40...125 [mA] • (hardware values) • output current in OFF state >= 40...100 [mA] • (hardware values)	• Engine speed > 512 RPM • ECT > -30 [°C] • engine stop not active	• 0.8 s	• Continuous • 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P039B	Knock Control functional check	• ratio between knock sensor and knock threshold in main knock window > 1.50...2.50 [-] • for time >= 540.00 [° CRK] • and • ratio between engine roughness and engine roughness threshold <= 2.00...3.00 [-] • or • ratio between knock sensor and knock threshold in main knock window > 2.00...3.00 [-] • for time > 9000.00 [° CRK]	• engine running • ECT > 70 [°C] • engine speed 1504...6400 [rpm] • engine load 55.00...100.00 [%] • MAF > 0.40...0.50 [g/rev] • misfire detection active	• 0.0 [° CRK	• Continuous • 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Checking", page 869

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03A5	Knock Control functional check	• ratio between knock sensor and knock threshold in main knock window > 1.50...2.50 [-] • for time >= 540.00 [° CRK] • and • ratio between engine roughness and engine roughness threshold <= 2.00...3.00 [-] • or • ratio between knock sensor and knock threshold in main knock window > 2.00...3.00 [-] • for time > 9000.00 [° CRK]	• engine running • ECT > 70 [°C] • engine speed 1504...6400 [rpm] • engine load 55.00...100.00 [%] • MAF > 0.40...0.50 [g/rev] • misfire detection active	• 0.0 [° CRK	• Continuous • 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Checking", page 869

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03 AF	Knock Control functional check	• ratio between knock sensor and knock threshold in main knock window > 1.50...2.50 [-] • for time >= 540.00 [° CRK] • and • ratio between engine roughness and engine roughness threshold <= 2.00...3.00 [-] • or • ratio between knock sensor and knock threshold in main knock window > 2.00...3.00 [-] • for time > 9000.00 [° CRK]	• engine running • ECT > 70 [°C] • engine speed 1504...6400 [rpm] • engine load 55.00...100.00 [%] • MAF > 0.40...0.50 [g/rev] • misfire detection active	• 0.0 [° CRK	• Continuous • 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Checking", page 869

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03B9	Knock Control functional check	• ratio between knock sensor and knock threshold in main knock window > 1.50...2.50 [-] • for time >= 540.00 [° CRK] • and • ratio between engine roughness and engine roughness threshold <= 2.00...3.00 [-] • or • ratio between knock sensor and knock threshold in main knock window > 2.00...3.00 [-] • for time > 9000.00 [° CRK]	• engine running • ECT > 70 [°C] • engine speed 1504...6400 [rpm] • engine load 55.00...100.00 [%] • MAF > 0.40...0.50 [g/rev] • misfire detection active	• 0.0 [° CRK	• Continuous • 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Checking", page 869
P0410	Secondary Air Injection System	• Diff. pressure value after secondary air injection vs. pressure value before secondary air activation > 5.0 kPa	• ECT -10...115 [°C] • IAT -10...100 [°C] • modeled catalyst temp. < 700 [°C] • mass air flow 7.00...140.00 [kg/h] • delta engine load -768.00...767.98 [%] • altitude < 2700 • AIR system commanded off	• 0.5 s	• Once/ DCY • 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ "3.6.29 Secondary Air Injection Sensor 1 G609 , Checking", page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ "3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking", page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ "3.6.31 Secondary Air System GX24 , Checking", page 911 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0413 AIR System Switching Valve "A" Circuit Open	Secondary Air Valve Open Circuit	• Output voltage (hardware values) 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Secondary Air Valve Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
	Secondary Air Valve Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) > 8.0 – 11.0 A	• Engine running • Actuator commanded on			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection Pump Relay Open Circuit	• Output voltage (hardware values) 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420	Catalyst System Efficiency Below Threshold	• Cat efficiency (arithmetic average) > 1.00 [-]	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.00 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 sec. • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 to 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions • ECT > 60° C	• 86.5 s • Once / DCY	• 2 DCY	– Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.32 Three Way Catalytic Converter, TWC Checking”, page 914 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• IAT > -48° C • Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 to 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0% • Dynamic MAF < 25.01 mg/stk			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.00 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P043E	EVAP System Out Of Range High	• Evap pump current during reference measurement > 40.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 to 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P043F	EVAP System Out Of Range Low	• Evap pump current during reference measurement < 15.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 to 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0441	Evaporative Emission System Incorrect Purge Flow	• purge valve quality < 0.05 [-]	• altitude < 2700 [m] • engine speed 1200...2750 [rpm] • engine load (absolute) > 20.00...30.00 [kPa] • engine load (relative) > 6.00...9.49 [%] • ECT > 60 [°C] • AAT > 4 [°C] • engine load deviation < | 3.00 | [%] • engine speed deviation n.a. • integrated mass air flow > 2.70...5.00 [kg] • lambda control closed loop • evap purge adaptation < 0.20...0.60 [-] • engine in idle n.a. • vehicle speed <= n.a. [km/h]	• 6.0 s	• Once/ DCY • 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442	Evaporative Emission System Leak Detected Small Leak	Time for pressure drop < 1.6 – 1.8 s	• Time after engine start 12.0 – 65,530.0 s • ECT 3.8 – 120° C • ECT at start 5 – 50° C • Engine off time > 21,600.0 s • Ambient air temp 5 – 59° C • Ambient air temp drop after start < 8 K • Intake manifold vac. > -2,560 hPa • Altitude < 2,700 m • Veh. speed >= 0 • Veh speed once > 40 km/h • Any drive gear • Restart temp diff. > 0 K • Purge valve closed • LDP active	• 139.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) > 3.13; <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0445 EVAP System Purge Control Valve "A" Circuit Shorted	EVAP Purge Valve Short To Ground	• Output voltage (hardware values) 1.92 – 2.21 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
	EVAP Purge Valve Short To Battery Plus	• Actuator temperature 160 – 200° C • Or • Output current (hardware values) > 4.0 – 7.0 A	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) >= 3.13% • Actuator commanded on			
P0447 EVAP System Vent Control Circuit Open	EVAP Leak Detection Pump Valve Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range (hardware values) 2.75 – 3.36 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
P0448 EVAP System Vent Control Circuit Shorted	EVAP Leak Detection Pump Valve Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
	EVAP Leak Detection Pump Valve Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) > 1.0 – 2.0 A	• Actuator commanded on			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455	Evaporative Emission System Leak Detected Gross Leak/No Flow	Time for pressure drop < 1.0 s	• Time after engine start 12.0 – 65,530.0 s • ECT 5 – 120° C • ECT at start 5 – 50° C • Engine off time > 21,600.0 s • Ambient air temp 5 – 59° C • Ambient air temp drop after start < 12 K • Intake manifold vac. > -2,560 hPa • Altitude < 2,700 m • Veh. speed >= 0 • Veh speed once > 40 km/h • Any drive gear • Restart temp diff. > 0 K • Purge valve closed • LDP active	136.0 s	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Rationality Check	• Difference pump current vs. small leak reference current < 0.0 mA • And • Pump current measurement time > 600.0 s • And • Pump current gradient >= 0.30; <= 0.01 mA/s • Pump current gradient < 0.002 mA/s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Evap purge adaptation < 0.30 [-] • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient < 0.002 mA/s • And • Ratio between actual pump current and small leak reference pump current < 1.10 [-]				– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
		• Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient >= 0.30; <= 0.01 mA/s				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491	Secondary Air System Insufficient Flow	• blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] • leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] • and • relative AIR pressure measured <= 5.00 [kPa] • or • blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.51 [-] • leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.48 [-] • and • relative AIR pressure measured <= 5.00 [kPa] • or • average pressure difference between absolute value and filtered n.a. • and • relative AIR pressure measured <= 5.00 [kPa]	• ECT -10...115 [°C] • IAT -10...100 [°C] • modeled catalyst temp. < 700 [°C] • mass air flow 7.00...140.00 [kg/h] • delta engine load -768.00...767.98 [%] • altitude < 2700 [m] • air system commanded on	• 0.0 s	• 2 DCY • Once / DCY	– Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0501	Vehicle Speed Sensor Range/ Performance	• vehicle speed < 2 km/h	• time after ignition on > 500 [ms • fuel cut off active • for time > 6.0 [s]	• 4.0 s	• 2 DCY • Continuous	– Check the vehicle speed signal. Refer to ⇒ “3.6.35 Vehicle Speed Signal, Checking”, page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
P0506	Idle Air Control System RPM Lower Than Expected	• negative engine speed deviation from setpoint > 80 [rpm] • and • RPM controller torque value >= calculated max. value	• vehicle speed 0 [km/h] • external torque request not demanded • throttle actuator commanded on • evap purge flow < 8.00 [kg/h] • time after engine start n.a. • clutch switch n.a. • barometric pressure > 70.00 [kPa] • catalyst heating not active • ECT > -9 [°C] • additional conditions: • time since n.a. • last drive change (automatic transmission) • or • last driver torque request • or • vehicle speed = 0 after stopping	• 6.1 s	• 2 DCY • Multiple	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0507	Idle Air Control System RPM Higher Than Expected	• positive engine speed deviation from setpoint > 80 [rpm] • and • RPM controller torque value <= calculated min. value	• vehicle speed 0 [km/h] • external torque request not demanded • throttle actuator commanded on • evap purge flow < 8.00 [kg/h] • time after engine start n.a. • clutch switch n.a. • barometric pressure > 70.00 [kPa] • catalyst heating not active • ECT > -9 [°C] • additional conditions: • time since n.a. • last drive change (automatic transmission) • or • last driver torque request • or • vehicle speed = 0 after stopping	• 6.1 s	• 2 DCY • Multiple	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P050A	Cold Start Monitoring Idle Controller out of range high	• positive engine speed deviation from setpoint > 80 [rpm] • and • RPM controller torque value <= calculated min. value	• vehicle speed 0 [km/h] • external torque request not demanded • throttle actuator commanded on • evap purge flow < 8.00 [kg/h] • time after engine start n.a. • clutch switch n.a. • barometric pressure > 70.00 [kPa] • catalyst heating active • ECT > -9 [°C] • additional conditions:	• 7.0 s	• 2 DCY • Multiple	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Idle Controller out of range low	• negative engine speed deviation from setpoint > 80 [rpm] • and • RPM controller torque value >= calculated min. value	• time since n.a. • last drive change (automatic transmission) • or • last driver torque request • or • vehicle speed = 0 after stopping			
P050B	Cold Start Ignition Timing Performance	• difference between commanded ignition timing efficiency vs. actual value > 20 %	• catalyst heating @ idle active • commanded ignition timing efficiency during catalyst heating <= 80.00 [%] • fuel-fed overrun active • or • engine idle • pressure ratio @ throttle <= 1.00 [-] • delta mass air flow setpoint n.a. • delta engine speed n.a. • vehicle speed 0 [km/h]	• 6.0 s	• Once/DCY • 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P053F Cold Start Fuel Pressure Per-	Cold Start Monitoring Fuel System Out Of Range Low	• Deviation between set point and actual fuel pressure > 1,500.2 kPa	• General: • Engine speed > 608 RPM • catalyst heating active	• 8.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
formance Bank 2	Cold Start Monitoring Fuel System Out Of Range High	• Deviation between set point and actual fuel pressure < -1,500.2 kPa	• ECT > -48 [°C] • time after engine start > 3.0 [s] • mass fuel flow setpoint at catalyst heating >= 5.00 [mg/stk] • for time >= 3.0 [s] • mass fuel flow setpoint > 1.99 [mg/stk] • delay time after request for mass fuel flow setpoint >= 1.0 [s]			⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0601	ECM: Checksum checksum verification	• calibration checksum incorrect		• 1.0 s	• 2 DCY • Continuous	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0603	Injection Valves Supply Voltage internal hardware check	• communication between microcontroller and SDI-Driver powerstage failed • SPI communication with ATIC failed		• 4320.00 [°CRK] • 2.0 s	• 2 DCY • Continuous	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0606	ECM Processor Fault	• SPI Bus counter > 50.00 [-] • SPI initialization failure		• 120 s	• 2 DCY • Continuous	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		• measured barometric pressure > 115.00 [kPa		• 5.0 s		

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• measured barometric pressure < 45.00 [kPa		• 5.0 s		
		• barometric pressure sensor voltage < 0.20 [V]		• 0.5 s		
		• barometric pressure sensor voltage > 4.80 [V]		• 0.5 s		
		• by engine stop • difference between barometric pressure and upstream throttle pressure >= | 7.50 | [kPa • and • difference between barometric pressure and intake manifold pressure >= | 7.50 | [kPa	• case 1: engine stop during DCY • vehicle speed < 1 [km/h] • engine stop active • engine stop >= 5.0 [s] • time after conditions are fulfilled >= 10.0 [s] • case 2: engine stop at start of DCY • vehicle speed < 1 [km/h] • engine stop active • engine stop >= 5.0 [s]	• 3.0 s	• 2 DCY • multiple	
		• by ECM keep alive time vehicle speed < 1 [km/h] difference between barometric pressure and intake manifold pressure >= | 7.50 | [kPa] • or • difference between barometric pressure and upstream throttle pressure >= | 7.50 | [kPa]	• vehicle speed < 1 [km/h] • ignition off • ECM keep alive time > 10.0 [s] • engine stop active • engine stop >= 5.0 [s] • barometric pressure sensor voltage 0.20...4.80 [V] • intake manifold pressure sensor voltage 0.20...4.80 [V] • turbocharger boost pressure sensor voltage 0.20...4.80 [V]	• 3.0 s	• 2 DCY • Once/ DCY	

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• knock control malfunction: signal acquisition error	• engine running	• 6.4 s	• Continuous • 2 DCY	
		• EEPROM information failure		• 1.0 s	• Continuous • 2 DCY	
		• decryption of NVMCrypt failed		• 1.0 s	• 2 DCY • Once/ DCY	
		• finished NVMCrypt integrity error		• 1.0 s	• 2 DCY • Once/ DCY	
		• communication between sample software and production hardware error		• 1.0 s	• 2 DCY • Once/ DCY	
		• RAM error detected	• microcontroller failure • reset counter > 1.0 [-]	• 0.04 s	• 2 DCY • Once/ DCY	
		• RAM error detected		• 0.01 s	• Continuous • 2 DCY	
		• difference between AD-channel 1 and AD-channel 2 > | 0.30 | [V]		• 0.5 s	• Continuous • 2 DCY	
		• engine speed > 1760 [rpm]	• engine speed limitation active • injection active	• 0.5 s	• Continuous • 2 DCY	
		• internal check failed		• 0.040 s	• Continuous • 2 DCY	
		• engine torque overflow > 45.00 [Nm]	• throttle actuator commanded on			
P062B	Internal Control Module Fuel Injector Control Performance	Internal logic failure	Engine speed > 80 RPM	2.2 s	• 2 DCY	– Replace the Engine Control Module -J623- . Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0634	ECM Internal Temperature Too High	• bypass valve driver temperature > 170...190 [°C]	• control valve commanded on	• 0.2 s	• Continuous • 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0638	Throttle Actuator Basic Settings adaptation value monitoring (start check)	• difference between actual TPS 1 or 2 voltage and voltage reference position > | 0.07 | [V] • difference between actual throttle and reference position > | 0.503 | [°TPS	• throttle start check active • accelerator pedal value < 99.90 [%] • engine speed < 64 [rpm] • vehicle speed < 2 [km/h] • IAT > 5 [°C] • ECT 5...101 [°C]	• 0.01 s	• 2 DCY • Once/ DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Basic Settings adaptation value monitoring (top limit)	• difference between actual throttle and reference position > | 0.503 | [°TPS • difference between actual TPS 1 or 2 voltage and voltage reference position > | 0.07 | [V]				
	Throttle Actuator Basic Settings adaptation value monitoring (bottom limit)	• difference between actual throttle and reference position > | 0.503 | [°TPS • difference between actual TPS 1 or 2 voltage and voltage reference position > | 0.07 | [V]				

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Basic Settings adaptation value monitoring (mechanical stop low)	• TPS 1 voltage < 0.40; > 0.80 [V] • or • TPS 2 voltage < 4.20; > 4.60 [V]				
	Throttle Actuator Basic Settings adaptation value monitoring (limp home position)	• difference between actual TPS 1 or 2 voltage and voltage reference position > | 0.25 | [V]				
P0642	ECM: 5V Supply Voltage out of range low	• analog output 1 supply voltage < 4.62 [V]		• 0.2 s	• Continuous • 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0643	ECM: 5V Supply Voltage out of range high	• analog output 1 supply voltage > 5.43 [V]		• 0.2 s	• Continuous • 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0651	Sensor Reference Voltage B Circuit Open	Signal voltage deviation > +/- 0.3 V		0.5 s	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0652	ECM: 5V Supply Voltage out of range low	• analog output 2 supply voltage < 4.62 [V]		• 0.2 s	• Continuous • 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0653	ECM: 5V Supply Voltage out of range high	• analog output 2 supply voltage > 5.43 [V]		• 0.2 s	• Continuous • 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0657	Actuator Supply Voltage Circuit Open	• output voltage, lower range >= 1.85...2.28 [V] • output voltage, upper range (hardware values) <= 2.75...3.36 [V]	• Relay, commanded off	• 1.0 s	• 2 DCY • Continuous	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0658	Actuator Supply Voltage Circuit Low	• output voltage (hardware values) < 1.85...2.28 [V]	• Relay, commanded off	• 1.0 s	• 2 DCY • Continuous	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0659	Actuator Supply Voltage Circuit High	• output current > 1.0...2.0 [A] • or • actuator temperature (hardware values) > 155...185 [°C]	• Relay, commanded on	• 1.0 s	• 2 DCY • Continuous	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0686	Main Relay rationality check during engine off	• sensed circuit voltage > 6.00 [V • output voltage < 1.85...2.28 [V]	• main relay commanded off • for time >= 0.3 [s] • main relay commanded off • for time >40 ms	• 0.1 s • 0.2 s	• 2 DCY • Continuous	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0687	Main Relay short to battery plus / rationality check during engine on	• main relay driver temperature > 155...185 [°C] • or • main relay output current > 1.0...2.0 [A] • sensed circuit voltage < 5.00 [V]	• main relay commanded on • for time >= 0.4 [s] • main relay commanded on • for time >= 0.1 [s]	• 0.2 s • 0.1 s	• 2 DCY • Continuous	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P128F	Engine Coolant Temperature Sensor @ Radiator Outlet short to battery / open circuit	• sensor voltage > 4.90 [V]	• IAT at throttle >= -33 [°C] • time after engine start > 60.0 [s]	• 0.5 s	• 2 DCY • Continuous	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P1291	Engine Coolant Temperature Sensor @ Radiator Outlet short to ground	• sensor voltage < 0.30 [V]		• 0.5 s	• 2 DCY • Continuous	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	• Fuel mass controller output < -45.0% • And • High pressure controller output > 8 mg	• Engine speed > 608 – 1,088 RPM • Mass fuel flow set point 1.99 – 20.01 mg/rev • For time >= 1.0 [s] • Time after change to DFI n.a. • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating n.a. • Full load n.a. • Catalyst purge not active • Lambda control closed loop • Evap purge functionality diagnosis not active • Canister load <= 0.70. [-] • Or • Evap purge valve not active or closed	• 10.0 s	• 2 DCY • Continuous	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12 A2	Fuel Rail Pressure Sensor Inappropriately High	• Fuel mass controller output > 30.0% • And • High pressure controller output < -17 mg	• Engine speed > 608 – 1,088 RPM • Mass fuel flow set point 1.99 – 20.01 mg/rev • For time >= 1.0 [s] • Time after change to DFI n.a. • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating n.a. • Full load n.a. • Catalyst purge not active • Lambda control closed loop • Evap purge functionality diagnosis not active • Canister load <= 0.70. [-] • Or • Evap purge valve not active or closed	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12 A4	Fuel Rail Pump Control Valve Stuck Closed	• Deviation between fuel pressure set point and current fuel pressure < -2,000.10 kPa • and • fuel mass controller output -50.00...50.00 [%] • Case 1: • High pressure controller output < -30 mg • case 2: • fuel pump commanded on • mass fuel flow setpoint > 15.01 [mg/rev]	• Engine speed > 608 – 6,816 RPM • fuel injection time not at min. value • Mass fuel flow set point 0.01...1.39 mg/rev • For time >= 1.0 [s] • Engine start not active • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating not active • Full load n.a. • Catalyst purge n.a. • Lambda control n.a. • Evap purge functionality diagnosis n.a. • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 5.0 s	• 2 DCY • Continuous	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .
P150 A	Engine Off Timer Performance	• during ECM keep alive time difference between engine-off-time and ECM keep alive-time < 15.0; > 15.0 [s] • after ECM keep alive time difference between engine-off-time and ECM keep alive-time < 15.0 [s]	• ignition on • CAN active • last keep alive valid	• 10.0 ms	• 2 DCY • Once/ DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are present, replace the Engine Control Module -J623- . Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1545	Throttle Actuator out of range	• control duty cycle > 98.00 [%]	• throttle position not at min. value • throttle adaptation not active • throttle actuator commanded on	• 0.7 [s]	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator rationality check	• difference between throttle position set-point and throttle flap opening angle for electronic throttle control > | 2.998...24.982| [°TPS	• throttle adaptation not active • throttle actuator commanded on • difference between throttle position set point and throttle flap opening angle <= 1.999; > -1.999 [° TPS]	• 0.5 [s]	• 2 DCY • Continuous	
P169A	Vehicle in Transport Mode	• Transport mode active	• vehicle speed < 5 [km/h] • max trip mileage since initial vehicle start-up < 100.0 [km] • during ECM keep alive-time after ignition off • engine speed 0 [rpm] • production mode not active • for hybrid: • drive motor off	• 0.01 [s]	• 1 DCY • Continuous	– Vehicle is in Transport Mode (Loading Mode). It can be turned off with a scan tool or will automatically switch off after approximately 100 km (62.15 miles) have accumulated on the vehicle. May need to perform readiness check. Refer to ⇒ “3.2 Readiness Code”, page 14 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2004	Intake Manifold Runner Flap Actuator stuck open	• signal voltage > 0.70 [V] • for time >= 1.5 [s]	• flap commanded off • time after engine start > 5.0 [s]	• 0.2 [s]	• 2 DCY • Continuous	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2006	Intake Manifold Runner Flap Actuator stuck close	• signal voltage < 0.70 [V] • for time >= 1.5 [s]	• flap commanded on • time after engine start > 5.0 [s]	• 0.2 [s]	• 2 DCY • Continuous	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2008	Intake Manifold Runner Control Circuit Open	• output voltage, lower range 1.85...2.28 [V] • output voltage, upper range 2.75...3.36 [V]	• engine running • actuator commanded off	• 0.5 [s]	• 2 DCY • Continuous	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2009	Intake Manifold Runner Control Circuit Low	• output voltage < 1.85...2.28 [V]	• engine running • actuator commanded off	• 2.0 s	• 2 DCY • Continuous	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2010	Intake Manifold Runner Control Circuit High	• power stage temperature > 155...185 [°C] • or • output current (hardware values) > 1.0...3.0 [A]	• engine running • actuator commanded on	• 2.0 s	• 2 DCY • Continuous	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2014	Intake Manifold Runner Position Sensor Circuit	• intake manifold runner flap position sensor voltage < 0.20 [V]	• engine start not active	• 2.0 s	• 2 DCY • Continuous	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2017	Intake Manifold Runner Flap Position Sensor short to battery plus	• intake manifold runner flap position sensor voltage > 4.80 [V]	• engine start not active	• 0.04 s	• 2 DCY • Continuous	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2088	A Camshaft Position Actuator Control Circuit Low	• output voltage < 1.85...2.28 [V]	• actuator commanded off	• 2.0 s	• 2 DCY • Continuous	– Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2089	A Camshaft Position Actuator Control Circuit High	• power stage temperature > 155...185 [°C] • or • output current (hardware values) > 8.0...11.0 A	• actuator commanded on	• 2.0 s	• 2 DCY • Continuous	– Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P2096	Fuel System Out Of Range Low	• Adaption value < -0.05 [-]	• 2nd lambda control closed loop • Catalyst purge not active • combustion mode change not active • Engine speed >= 704 RPM	• 5.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097	Fuel System Out Of Range High	• Adaption value > 0.05 [-]	• 2nd lambda control closed loop • Catalyst purge not active • combustion mode change not active • Engine speed >= 704 RPM	• 5.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .
P2100	Throttle Actuator open circuit	• electronic throttle valve driver load resistance > 200.0 [kOhm	• difference between measured and filtered throttle position <= 119.500 0.1° TPS • Actuator commanded off	• 0.1 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P2101	Throttle Actuator over temperature	• electronic throttle valve driver temperature (hardware values) > 170.0...190.0 [°C]	• Actuator commanded on	• 0.1 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2103	Throttle Actuator short circuit	• electronic throttle valve driver current (hardware values) > 9.3...15.0 [A]	• Actuator commanded on	• 0.1 s	• 2 DCY • Continuous	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2106	Throttle Actuator Control System - Forced Limited Power	Internal check failed	• Duty cycle > 80% or deviation throttle value angles vs. calculated value > 4 - 50%	• 0.5 – 5.0 s	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2122	APP Sensor 1/ APP Sensor 2 Circuit D Low Input	• signal voltage sensor 1 < 0.39 [V]		• 0.3 s	• 2 DCY • Continuous	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2123	APP Sensor 1/ APP Sensor 2 Circuit D High Input	• signal voltage sensor 1 > 4.86 [V]		• 0.3 s	• 2 DCY • Continuous	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2127	APP Sensor 1/APP Sensor 2 Circuit E Low Input	• signal voltage sensor 2 < 0.19 [V]		• 0.3 s	• 2 DCY • Continuous	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2128	APP Sensor 1/APP Sensor 2 Circuit E High Input	• signal voltage sensor 2 > 2.80 [V]		• 0.3 s	• 2 DCY • Continuous	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking", page 848 .
P2138	APP Sensor 1/APP Sensor 2 Circuit D/E Voltage Correlation	• difference between signal voltage sensor 1 and sensor 2 > 0.10...0.12 [V]		• 0.4 s	• 2 DCY • Continuous	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ "3.6.1 Accelerator Pedal Module GX2 , Checking", page 848 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2177	System Too Lean Off Idle	• Adaptive value >= 28.00 [%]	• lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] • engine speed > 576 [rpm] • ECT > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C] • direct injection by combustion mode manager active • mass fuel flow 0.984...0.992 mg/stk • evap purge valve closed	• 5.0 s	• 2 DCY • Continuous	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Testing", page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2178	System Too Rich Off Idle	• Adaptive value <= -25.00 [%]	• lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] • engine speed > 576 [rpm] • ECT > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C] • direct injection by combustion mode manager active • mass fuel flow 0.984...0.992 mg/stk • evap purge valve closed	• 5.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Check-

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						ing", page 877 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .
P2181	Cooling System Performance	• cooling system temperature to low < 60...70 [°C]	• modeled ECT > 60...70 [°C] • ECT @ first start > -10 [°C] • ECT @ first start < 40...50 [°C] • min. AAT > -10 [°C] • at time of fault decision: • ratio fuel cut off <= 10.16 [%] • ratio maximum vehicle speed <= 14.84 [%] • for vehicle speed > 120 [km/h] • ratio start-stop time <= 16.02 [%] • ratio engine load time <= 39.84 [%] • for air mass flow ratio with max air mass flow < 2.50 [%] • and for air mass flow ratio with max air mass flow > 40.00 [%]	• 430.0 (Unified) [s]	• 2 DCY • Once/ DCY	– Check the Engine Coolant Temperature Sensor -G62- . Refer to ⇒ "3.6.9 Engine Coolant Temperature Sensor G62 , Checking", page 865 . – Check the Engine Coolant Temperature Sensor On Radiator Outlet -G83- . Refer to ⇒ "3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking", page 867 . – Check the After-Run Coolant Pump -V51- . Refer to ⇒ "3.6.2 After-Run Coolant Pump V51 , Checking", page 851 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2183	Engine Coolant Temperature Sensor @ Radiator Outlet cross check	• diff. ROT vs. IAT @ first engine start (depending on engine off time) > |20| [K] • and • diff. ROT vs. AAT @ first engine start (depending on engine off time) > |20| [K] • and • diff. AAT vs. IAT @ first engine start (depending on engine off time) < |20| [K]	• engine off time > 360.00 [min] • decrement check to ensure an cold vehicle state: • diff. IAT vs. min. IAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. ROT vs. min. ROT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s] • diff. AAT vs. min. AAT @condition < 4.5 [K] • vehicle speed > 20 [km/h] • for time > 20.0 [s]	• 100.0 s	• 2 DCY • Once/ DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2187	System Too Lean At Idle	• Adaptive value >= 2.40 [mg/stk]	• lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] engine speed > 576 [rpm] • ECT > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C] • direct injection by combustion mode manager active • mass fuel flow < 0.00...17.00 mg/stk • evap purge valve closed	• 5.0 s	• 2 DCY • Continuous	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188	System Too Rich At Idle	• Adaptive value <= -2.40 [mg/stk]	• lambda control closed loop • barometric pressure > 73.00 [kPa] • mass air flow > 60.00 [mg/stk] engine speed > 576 [rpm] • ECT > 55 [°C] • IAT at intake manifold > -48 [°C] • AAT > -48 [°C] • direct injection by combustion mode manager active • mass fuel flow < 0.00...17.00 mg/stk • evap purge valve closed	• 5.0 s	• 2 DCY • Continuous	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Check-

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						ing”, page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195	O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	• lambda value > 1.15 [-] • O2S rear voltage >= 0.88 [V]	• O2S front ready • O2S rear ready • ECT >= -48 [°C] • limited dynamic conditions active • mass air flow > 15.00; < 300.00 [kg/h] • catalyst purge not active • engine speed > 1152 [rpm] • exhaust gas temperature at O2S rear > -273; < 800° C • combustion mode change not active	• 72.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196	O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	• lambda value < 0.85 [-] • O2S rear voltage <= 0.25 [V]	• O2S front ready • O2S rear ready • ECT >= -48 [°C] • limited dynamic conditions active • mass air flow > 15.00; < 300.00 [kg/h] • catalyst purge not active • engine speed > 1152 [rpm] • exhaust gas temperature at O2S rear > -273; < 800° C • combustion mode change not active	• 72.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1	• case 1: • O2S front voltage > 1.95; < 2.05 [V] • lambda set value n.a. • case 2: • lambda set value < 0.83 [-] • cat heater previous driving cycle failure • case 3: • fuel cut off active • cat heater previous driving cycle no failure • and • O2S front voltage < 2.10 [V] • for time >= 4.0 [s]	• O2S front active • engine stop • combustion mode change not active	• 1.1 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2243	O2 Sensor Reference Voltage Circuit Open Bank 1 Sensor 1	• O2S front voltage <= 0.20 [V] • AND • O2S front heater failure active	• O2S front active • engine stop not active • combustion mode change not active	• 9.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2251	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1	• case 1: • O2S front voltage > 1.95; < 2.05 [V] • lambda set value n.a. • case 2: • lambda set value < 0.83 [-] • cat heater previous driving cycle failure • case 3: • fuel cut off active • cat heater previous driving cycle no failure • and • O2S front voltage < 2.10 [V] • for time >= 4.0 [s]	• O2S front active • engine stop • combustion mode change not active	• 9.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2257	Secondary Air Injection System Control Circuit Low	• Output voltage (hardware values) < 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s	• 2 DCY • Continuous	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2258	Secondary Air Injection System Control Circuit High	• Actuator temperature > 155 to 185° C • Or • Output current (hardware values) > 1.0 – 2.0 A	• Engine running • Actuator commanded on	• 0.5 s	• 2 DCY • Continuous	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270	O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	• case 1: • max. O2S rear voltage < 0.87 [V] • and • oxygen load during Peak Max detection > 2.6 [g] • or • case 2: • max. O2S rear voltage < 0.87 [V] • and • oxygen load during Peak Max detection > 2.5 [g] • and • counter in case of suspected Peak Max error > 5000.00 [-]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= 1600.00...3000.00 [kJ] • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < |0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [s] • temperature conditions • ECT > 60 [°C] • IAT > -48 [°C]	• 86.5 s	• 2 DCY • Once / DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. 500...700 [°C] • modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk]			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions • canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271	O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	• case 1: • min. O2S rear voltage > 0.25 [V] • and • oxygen load during Peak Min detection > 2.6 [g] • or • case 2: • min. O2S rear voltage > 0.25 [V] • and • oxygen load during Peak Min detection > 2.5 [g] • and • counter in case of suspected Peak Min error > 5000.00 [-]	• general conditions • vehicle speed >= 10 [km/h] • barometric pressure >= 73.00 [kPa] • catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • integrated heat energy >= [kJ] 1600 – 3000 • or • time after engine start > 215.0...1000.0 [s] • engine speed 1344...3008 [rpm] • lambda control value < |50.00| [%] • lambda controller deviation < | 0.08...0.15| [-] • quickpass trim control ready • proportional part of trim control < | 0.25 | [-] • lambda adaption commanded off • scavenging not active • valve lift not active • time after a catalyst purge phase >= 0.02 [• temperature conditions • ECT > 60 [°C] • IAT > -48 [°C] • modeled catalyst temp. 500...700 [°C]	• 86.5 s	• 2 DCY • Once/ DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• modeled catalyst temp. extended range 470...730 [°C] • integrated MAF, catalyst temp. conditions fulfilled > n.a. [g] • difference between dynamic and stationary catalyst temp. -254.0...254.0 [K] • difference between dynamic and stationary catalyst temp. extended range -304.0...304.0 [K] • modeled catalyst temperature @ start > 550 [°C] • modeled exhaust gas temperature at O2S rear <= 1201 [°C] • air mass flow conditions • MAF per cylinder 30.00...130.00 [kg/h] • MAF per cylinder extended range 25.00...135.00 [kg/h] • MAF 125.01...600.00 [mg/rev] • MAF extended range n.a. [mg/rev] • limited dynamics conditions • dynamic engine speed < 20 [rpm] • dynamic lambda controller output <= 20.00 [%] • dynamic MAF < 25.01 [mg/stk] • integrated MAF after dynamic conditions are fulfilled > 20.0 [g] • evap purge conditions			

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• canister load <= 2.00 [-] • or • evap purge valve closed • close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P2274	O2 Sensor Signal Stuck Lean Bank 1 Sensor 3	• Sensor voltage of <= 0.70 V • O2S rear signal not oscillating at reference < 0.62 – 0.65 V • Enrichment after stuck lean 27.9%	• Mass air flow 25 – 150 kg/h • O2S rear readiness > 30.0 s • Modeled exhaust gas temp > 350° C • 2nd lambda control closed loop	215.0 s	• 2 DCY	– Refers to vehicles with 3 oxygen sensor systems only.
P2275	O2 Sensor Signal Stuck Rich Bank 1 Sensor 3	• O2S sensor voltage >= 0.15 V • After oxygen mass flow (fuel cutoff) > 4,500 mg • Number of checks >= 1	• Time of fuel cutoff <= 90.0 s • Time after last fuel cutoff >= 20.0 s • O2S rear ready • Exhaust temp at sensor >= 385° C • Exhaust mass flow > 12 kg/h • Exhaust mass flow dynamic within range -80 – 80 kg/h • Sensor voltage at start of measurement > 0.45 V	10.0 s	• 2 DCY	– Refers to vehicles with 3 oxygen sensor systems only.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2279	Intake Air System rationality check @ idle	• deviation throttle area controller > 42.00 [%] • and • correction value (lambda controller and fuel trim) -28.00...28.00 [%]	• throttle position 0.00...100.00 [%] • engine speed 576...3008 [rpm] • modeled pressure quotient 0.27...0.60 [-] • time after engine start > 5.0 [s] • barometric pressure 73.00 – 107.50 kPa • lambda control closed • loop barometric pressure valid	• 5.0 s	• 2 DCY	– Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 ,

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air System rationality check @ part load	• deviation throttle area controller > 35.00 [%] • and • correction value (lambda controller and fuel trim) -50.00...50.00 [%]	• throttle position > 4.50 [%] • engine speed 1216 - 6000 [rpm] • modeled pressure quotient 0.63...0.90 [-] • time after engine start > 5.0 [s] • barometric pressure 73.00 – 107.50 kPa • lambda control closed loop • loop barometric pressure valid	• 5.0 s	• 2 DCY • Continuous	Checking”, page 871 .
P2293	Fuel Pressure Regulator 2 Performance	• Difference between target pressure vs actual pressure: > 1.50 MPa • Or • < -1.50 MPa	• Time after engine start 10.0 s • Fuel cutoff not active	• 3.0 s	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2294	Fuel Pressure Regulator 2 Control Circuit	• voltage high side 2.1...2.9 [V]	• case 1: • ignition on • engine speed 0 [rpm] • case 2: • ignition off (during ECM keep alive-time) • general: • actuator commanded off	• 0.0 s	• 2 DCY • Continuous	– Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P2295	Fuel Pressure Regulator 2 Control Circuit Low	• voltage high side < 2.1 [V] • OR • current high side > 13.4 [A]	• ignition on • OR • ignition off (during ECM keep alive-time) • AND • actuator commanded on	• 0.2 s	• 2 DCY • Continuous	– Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
		• voltage low side < 2.1 [V]	• ignition on • OR • ignition off (during ECM keep alive-time) • AND • actuator commanded off			
P2400	Evaporative Emission System Leak Detection Pump Control Circuit Open	• Output voltage 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s	• 2 DCY • Continuous	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s	• 2 DCY • Continuous	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	• Actuator temperature > 155 – 185° C • Or • Output current > 1.0 – 3.0 A (hardware values)	• Actuator commanded on	• 2.0 s	• 2 DCY • Continuous	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	• Pump current oscillation > 1.5 mA • And • Number of aborted leak measurements due to pump current oscillations > 0.0 [-]	• Time after measurement start > 4.0 s (during ECM keep alive-time)	• 624.0 s	• 2 DCY • Once / DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240A	EVAP Leak Detection Pump Heater open circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range 2.75 – 3.36 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240B	EVAP Leak Detection Pump Heater short to ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240C	EVAP Leak Detection Pump Heater short to battery plus	• Actuator temperature > 155 – 185° C • Or • Output current > 1.0 – 3.0 A (hardware values)	• Actuator commanded on	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414	O2 Sensor Exhaust Sample Error Bank 1, Sensor 1	• sensor voltage > 3.20 [V]	• O2S front pump current valid • engine running • fuel cut off not active • combustion mode change not active • time after conditions are fulfilled > 5.0 [s]	• 12.0 s	• 2 DCY • Continuous	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2431	Secondary Air Injection Sensor Performance	• Difference between AIR pressure and barometric pressure > 6.00 kPa • And • Difference between AIR pressure and intake manifold pressure > 6.00 kPa	• Engine stop • For time n.a.	• 0.1 s	• 2 DCY • Multiple	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – For Beetle or 2013 – 2014 Jetta, check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432	Secondary Air Injection Sensor Circuit Low	• Sensor voltage < 0.50 V		• 0.1 s	• 2 DCY • Continuous	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – For Beetle or 2013 – 2014 Jetta, check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .
P2433	Secondary Air Injection Sensor Circuit High	• Sensor voltage > 4.50 V		• 0.1 s	• 2 DCY • Continuous	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – For Beetle or 2013 – 2014 Jetta, check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2440	Secondary Air Injection System Switching Valve Stuck Open	• ratio of relative AIR pressure @ phase 1 and relative AIR pressure @ phase 2 > 1.50 [-] • or • difference of average pressure between absolute value and filtered value while secondary air valve is closed > 256.00 kPa	• ECT -10...115 [°C] • IAT -10...100 [°C] • modeled catalyst temp. < 700 [°C] • mass air flow 7.00...140.00 [kg/h] • delta engine load -768.00...767.98 [%] • altitude < 2700 • AIR system commanded on	• 0.0 s	• 2 DCY • Once/ DCY	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ "3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking", page 909 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 .
P2450	Evaporative Emission System Switching Valve Performance/ Stuck Open	• Time after measurement start > 2.0; < 2.5 s • And • Drop of evap pump current < 5.0 mA	• Barometric pressure > 74.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 0.5 s	• 2 DCY • Once / DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2564	Turbocharger Boost Control Position Sensor short to ground / open circuit	• turbocharger boost control position sensor voltage < 0.20 [V]		• 0.1 s	• 2 DCY • Continuous	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2565	Turbocharger Boost Control Position Sensor short to battery plus	• turbocharger boost control position sensor voltage > 4.80 [V]		• 0.1 s	• 2 DCY • Continuous	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P334A	Turbocharger Boost Pressure Control Valve Short Circuit	• Bypass valve driver current > 9.3 – 15.0 A (hardware values)	• Boost pressure actuator controller active	• 0.2 s	• 2 DCY • Continuous	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 – Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 .
U0001	High Speed CAN Communication Bus	• bus off counter >= 3.0 [-]	• time after ignition on >= 0.5 [s]	• 0.0 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U000 2	High Speed CAN Communication Bus Performance	• general CAN timeout >= 0.4 [s]	• time after ignition on >= 0.5 [s]	• 0.0 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U010 1	Lost Communication with TCM	• received CAN message No message	• Time after ignition on >= 500.0 ms	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance between the Transmission Control Module and the Engine Control Module - J623- . Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 859 .
U012 1	Lost Communication With Anti-Lock Brake System (ABS) Control Module	• received CAN message No message	• Time after ignition on >= 500.0 ms	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U014 0	CAN: Body Control Module (BCM) CAN communication with Body Control Module	• received CAN message no message	• Time after ignition on >= 500.0 ms	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U014 6	Lost Communication With Gateway A	• received CAN message no message	• Time after ignition on >= 500.0 ms	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	• received CAN message no message	• time after ignition on >= 0.5 [s]	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0302	Software Incompatibility with Transmission Control Module	• received AT vehicle data from TCM TCM signal	Time after ignition on, 500.0 ms	• 50.0 s	• 2 DCY • Continuous	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0323	CAN: Ambient Air Temperature Sensor communication with Instument Cluster Module	• ambient temperatur sensor: source configuration failure	• time after ignition on > 1.2 s	• 1.0 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0402	Invalid Data Received From Gear Shift Control Module A	• received data implausible message	• time after ignition on > 500 [ms]	• 0.5 s	• 2 DCY • Continuous	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0415	CAN Communication With ABS Error	• vehicle speed > 325 [km/h] • speed sensor signal: sensor error 327.42 [km/h] • speed sensor signal: initialization error 327.08 [km/h] • speed sensor signal: low voltage error 327.25 [km/h • speed sensor signal: range error 326.40...327.07 [km/h] • or • speed sensor signal: range error 327.09...327.24 [km/h] • or • speed sensor signal: range error 327.26...327.41 [km/h] • or • speed sensor signal: range error 327.43...327.67 [km/h] • received data implausible message	• time after ignition on > 500 [ms]	• 4.0 s • 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	• ambient air temperature signal failure • ambient temperature sensor: source in reset failure • received data from Instrument Cluster implausible message	• time after ignition on > 0.5 [s] • time after ignition on > 1.2 s • engine running • time after ignition on > 0.5 [s]	• 0.6 s • 2.0 s • 0.5 s	• 2 DCY • Continuous	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285- . Refer to appropriate repair manual.

DTC	Error Message	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0447	Lost Communication With Gateway	• received data implausible message	• time after ignition on >= 500 [ms]	• 0.5 s	• 2 DCY • Continuous	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
U1103	ECM: Production Mode function monitoring: mode change	• Production mode active	• vehicle speed < 5 [km/h] • max trip mileage since initial vehicle start-up < 100.0 [km] • during ECM keep alive-time after ignition off • engine speed 0 [rpm] • for hybrid: • drive motor off	• 0.01 [s]	• 1 DCY • Continuous	– Vehicle is in production mode. Refer to appropriate repair manual for resolution. Note the mode can be deactivated with a factory scan tool or will automatically turn off after vehicle accumulates the first 100 km (62.14 miles) of driving.

3.4.2 Engine Control Module , 2015 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Rationality Check	• Adjustment angle difference >= 3.0; < 15.0° CRK	• Modeled oil temperature -40 – -160° C • Engine speed 608 – 6,016 RPM • Set point change > 29.0° CRK • Camshaft position n.a. • Dynamic diagnosis timer >= 0.95 – 4.0 s	• 300.0 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 . – Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator Control Circuit/ Open Bank 1	VVT Actuator Intake Open Circuit	• Output voltage lower range 1.92 – 2.21 V • Output voltage upper range (hardware values) 2.85 – 3.25 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Rationality Check	• Camshaft position deviation > 10.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position n.a. • Camshaft position adjustment active • Catalyst heating not active	• 250.0 s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position/ Crankshaft Position Intake - Correlation Adaptation Value Monitoring	• Adapted value for each edge of the target wheel < -14.0° CRK • Or • Adapted value for each edge of the target wheel > 14.0° CRK	• Camshaft adjustment (exhaust side) active • Engine speed 288 – 4,000 RPM • Modeled oil temperature >= -15° C • Modeled oil temperature <= 160° C • Engine speed < 8,160 RPM • Diff. actual exhaust camshaft position vs. previous camshaft position @ reference signal edge < 2.0° CRK • And • Case 1: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • Or • Case 2: • Engine speed >= 380 RPM • Or • Engine running • And • Engine stalling >= 5.0 s • Or • Case 3: • Backwards rotation not detected • Or • Case 4: • Engine speed >= 400 RPM • Engine stopped	• 720.0° CRK • Multiple	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• O2S upstream heater voltage lower range 1.92 – 2.21 V • O2S upstream heater voltage upper range 2.85 – 3.25 V		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• O2S upstream heater voltage < 1.92 – 2.21 V		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• O2S upstream heater driver temperature > 160.0 – 200.0° C • Or • O2S upstream heater driver output current > 8.0 – 12.0 A	• EGT @ O2S front n.a. • Actuator commanded on	• 2.5 s • Continuous .	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0033 Turbocharger/Supercharger Bypass Valve "A" Control Circuit	Turbocharger Deceleration Bypass Valve Open Circuit	• Voltage lower range 1.92 – 2.21 V • Voltage upper range 2.85 – 3.25 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous .	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger Deceleration Bypass Valve Short To Battery Plus	• Current > 4.0 – 7.0 A • Or • Temperature > 160 – 200° C (hardware values)	• Actuator commanded on			to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0034 Turbocharger/Supercharger Bypass Valve "A" Control Circuit Low	Turbocharger Deceleration Bypass Valve Short To Ground	• Voltage < 1.92 – 2.21 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous .	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear Open Circuit	• O2S downstream heater voltage lower range 1.92 – 2.21 V • Or • O2S downstream heater voltage upper range 2.85 to 3.25 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear Short To Ground	• O2S downstream heater voltage < 1.92 – 2.21 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear Short To Battery Plus	• O2S downstream heater driver temperature > 160.0 – 200.0° C • Or • O2S downstream heater driver output current > 8.0 – 12.0 A	• EGT @ O2S rear (binary) >= 300° C • Actuator commanded on • Engine not in start process	• 2.5 s. • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0045 Turbocharger/Supercharger Boost Control "A" Circuit/Open	Turbocharger Boost Pressure Control Valve Open Circuit	• Bypass valve driver load resistance > 200 kΩ	• Deviation between actual and filtered boost pressure actuator position <= 5.0% • Boost pressure actuator controller not active • Time delay > 1.0 s	• 0.4 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0049 Turbocharger/Supercharger "A" Turbine Overspeed	Turbocharger Out Of Range High	• Turbocharger speed >= 240,002 RPM • Or • IAT @ throttle >= 336° C • For time >= 6.0 s	• Engine running	• 2.6 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ "3.6.34 Turbocharger Recirculation Valve N249 , Checking", page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .
P0068 MAP/ MAF - Throttle Position Correlation	Manifold Pressure Sensor Large Leakage Detection	• Diff. MAP set point vs. actual MAP < -15.0 – -10.0 kPa	• Fast throttle adaption finished • MAP gradient -200.0 – 200.0 kPa/sec. • Vehicle speed <= 2 km/h • Time after engine start > 5.0 s • Engine speed lower range > 576 RPM • Engine speed upper range < 3,000 RPM • IAT @ manifold > -48° C • ECT @ cylinder block > -48° C • Pressure quotient @ throttle 0.10 – 0.60 [-] • Load dynamic conditions: • Dynamic engine speed < 8,160 RPM • Dynamic air mass < 25.01 mg/rev	• 5.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9, Checking", page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air System Rationality Check	• Throttle cross-sectional area correction included controller and adaption < -60.0% • Lambda correction included controller and adaption -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaption active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaption finished • MAP gradient -200.0 – 200.0 kPa/sec. • Fuel cut off not active • Time after engine start > 5.0 s • Boost pressure 73.0 – 107.50 kPa • BARO 73.0 – 107.50 kPa			Checking”, page 871 .
P0070 Ambient Air Temperature Sensor Circuit "A"	CAN: Ambient Air Temperature Sensor Short To Battery / Open Circuit	• AAT sensor voltage (hardware values) > 4.50 V		• 2.0 s • Continuous	• 2 DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Ambient Air Temperature Sensor Cross Check	• Diff. AAT vs. IAT @ first engine start > 20 K (depending on engine off time) • And • Diff. AAT vs. ROT @ first engine start > 20 K (depending on engine off time) • And • Diff. IAT vs. ROT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure a cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. AAT vs. min. AAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0072 Ambient Air Temperature Sensor Circuit "A" Low	CAN: Ambient Air Temperature Sensor Short To Ground	• AAT sensor voltage < 0.10 V (hardware values)		• 2.0 s • Continuous	• 2 DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0087 Fuel Rail/ System Pressure - Too Low Bank 1	Fuel System Pressure Sensor, High Pressure Side Out Of Range Low	• Deviation between reference fuel pressure set point and current fuel pressure > 2,000.10 kPa • Case 1: • Fuel mass controller output -50.0 – 50.0% • High pressure controller output > 30 mg • Fuel pressure < 2,500.0 kPa • Case 2: • Fuel pump at max limit • Mass fuel flow set point n.a. • Fuel pressure n.a.	• Engine speed > 608 – 6,816 RPM • Mass fuel flow set point 15.01 – 1,389.00 mg/rev • For time after request for mass fuel flow set point >= 5.0 s • Engine start not active • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating not active • Full load n.a. • Catalyst purge n.a. • Lambda control n.a. • Evap purge functionality diagnosis n.a. • And • Choice of: • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 2.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Pressure Sensor, High Pressure Side Rationality Check Low	• Fuel mass controller output -50.0 – 50.0% • And • High pressure controller output > 35 mg • And • Deviation between fuel pressure set point and current fuel pressure > 2,000.10 kPa • And • Fuel pressure >= 2,500.00 kPa	• Engine speed > 608 – 6,816 RPM • Mass fuel flow set point 15.01 – 1,389.00 mg/rev • For time after request for mass fuel flow set point >= 5.0 s • Engine start not active • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating not active • Full load n.a. • Catalyst purge n.a. • Lambda control n.a. • Evap purge functionality diagnosis n.a. • And • Choice of: • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 5.0 s • Continuous		
P0090 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel Control Valve Open Circuit	• Voltage high side < 1.87 – 2.26 V • Voltage low side > 2.78 – 3.33 V	• Engine speed 0 RPM • Or • Fuel cut off active • Actuator commanded off	• 0.0 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Low and high side off: • Voltage low side > 2.78 – 3.33 V • Voltage high side < 1.87 – 2.26 V • Low and high side on: • Current low side < 12.2 – 15.0 A • Current high side < 13.5 – 16.5 A	• Engine speed > 600 RPM • And • Fuel cut off not active • Actuator commanded on			⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0091 Fuel Pressure Regulator 1 Control Circuit Low	Fuel Control Valve Short To Ground (High Side)	• Current high side > 13.5 – 17.0 A (hardware values)	• Ignition on • Or • Ignition off (during ECM keep alive-time) • And • Actuator commanded on •	• 0.2 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
	Fuel Control Valve Short To Ground (Low Side)	• Voltage low side < 1.87 – 2.26 V (hardware values)	• Ignition on • Or • Ignition off (during ECM keep alive-time) • And • Actuator commanded off •			
P0092 Fuel Pressure Regulator 1 Control Circuit High	Fuel Control Valve Short To Battery Plus (Low Side)	• Current low side > 13.5 – 17.0 A (hardware values)	• Ignition on • Or • Ignition off (during ECM keep alive-time) • And • Actuator commanded on •	• 0.2 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Control Valve Short To Battery Plus (High Side)	• Voltage high side < 2.78 – 3.33 V (hardware values)	• Ignition on • Or • Ignition off (during ECM keep alive-time) • And • Actuator commanded off •			– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P00AF Turbocharger/Supercharger Boost Control "A" Module Performance	Turbocharger Boost Pressure Control Valve Functional Check - Transient Check	• Boost pressure actuator position controller output > 98.0%	• Time after engine start >= 4.0 s • ECT > -40° C • AAT > -40° C • Catalyst heating not active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
		• Boost pressure actuator position controller output < -98.0%				
	Turbocharger Boost Pressure Control Valve Functional Check	• Deviation boost pressure actuator position controller > 12.0 – 100.0%				
P0100 Mass or Volume Air Flow Sensor "A" Circuit	Mass or Volume Air Flow Sensor "A" Circuit	• MAF sensor signal 0 µs	• Engine speed > 20 RPM	• 0.2 s	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0101 Mass or Volume Air Flow Sensor "A" Circuit Range/Performance	Mass or Volume Air Flow Sensor "A" Circuit Range/ Performance	• Upper threshold model > 60 – 800 kg/h • Lower threshold model < 0 – 400 kg/h • Load calculation > 18% • Fuel system < -18%	• Time after engine start 150 camshaft revolutions • Throttle position < 99.6% • Engine speed 1,280 – 6,000 RPM • ECT > 63° C • IAT < 90° C • Mass air flow 0 – 450 kg/h • Engine load 20 – 100% • Lambda control closed loop • EVAP purge valve closed • No low fuel signal	• 2.0 s	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0102 Mass or Volume Air Flow Sensor "A" Circuit Low	Mass or Volume Air Flow Sensor "A" Circuit Low	• MAF sensor signal < 66 µs	• Engine speed > 20 RPM	• 0.2 s	• 2 DCY	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0103 Mass or Volume Air Flow Sensor "A" Circuit High	Mass or Volume Air Flow Sensor "A" Circuit High	• MAF sensor signal > 4,500 µs	• Engine speed > 20 RPM	• 0.2 s	• 2 DCY	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/Performance	Manifold Pressure Sensor Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Case 2: Non charged engine • Diff. BARO mean value vs. MAP mean value >= n.a. kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) <= n.a. kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) > n.a. kPa • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time > n.a. kPa	• Case A: Engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case B: Engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. BARO mean value vs. MAP mean value > n.a. kPa				
		• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 [kPa • Case 2: Non charged engine • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time > n.a. kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive time 10.0 – 6,553.5 sec. • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Intake Air System Rationality Check	• Throttle opening area correction included controller and adaption > 40.0% • Lambda correction included controller and adaption < -28.0%	• Intake manifold modeled adaption active • Throttle position 0.000 – 100.003° TPS (by throttle opening area) • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 to 0.60 [-] • Fast throttle adaption finished • MAP gradient -200.0 – 200.0 kPa/sec. • Fuel cut off not active • Time after engine start > 5.0 s	• 5.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle opening area correction included controller and adaption < 40.0% • Lambda correction included controller and adaption > 28.0%	• Boost pressure 73.0 – 107.50 kPa • BARO 73.0 – 107.50 kPa			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Intake manifold pressure sensor voltage < 0.20 V		• 0.5 s	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery Plus	• Intake manifold pressure sensor voltage > 4.80 V		• 0.5 s	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 .
P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature Sensor Cross Check	• Diff. IAT vs. AAT @ first engine start > 20 K (depending on engine off time) • And • Diff. IAT vs. ROT @ first engine start > 20 K (depending on engine off time) • And • Diff. AAT vs. ROT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure a cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. AAT vs. min. AAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT sensor voltage < 0.10 V		• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Open Circuit	• IAT sensor voltage > 4.50 V		• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature Sensor No Change On Signal	• Diff. max. ECT vs. min. ECT < 1.5 K	• ECT range conditions: • ECT @ start < 82; > 98° C • And • ECT @ start n.a. • Driving condition H: • Engine part load • Or • Engine full load • Engine speed > 1,300 RPM • Vehicle speed > 50 km/h • Ratio air mass flow to max. air mass flow > 6.0% • Time after conditions are fulfilled > 30.0 – 60.0 s • Driving condition L: • Engine idle • Vehicle speed n.a. • Or • Fuel cut off active • Time after conditions are fulfilled > 30 – 60 s	• 120.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
	Engine Coolant Temperature Sensor @ Cylinder Block Rationality Check Inappropriately Low	• Diff. min temperature of cross check sensors vs. ECT @ cylinder block @ engine start >= 10° C	• Cross checks finished	• 1.0 s. • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor @ Cylinder Block Rationality Check High	• ECT @ cylinder block @ engine start > 40 – 80° C	• Cross checks finished • Engine running • Engine off time >= 240.00 min • Valid AAT signal for time >= 2.0 s • Valid engine stop signal for time >= 3.0 s			
	Engine Coolant Temperature Sensor @ Cylinder Block Rationality Check Low	• Difference between modelled and measured cylinder block temperature > 10° C	• ECT @ cylinder block -128 – 127° C • Time after engine start > 60.0 s	• 10.0 s • Once / DCY		
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT sensor voltage < 0.30 V		• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT sensor voltage > 4.90 V	• IAT at throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P0121 Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	Throttle Position Sensor 1 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 1 >= 1.00 [-] • Or • Relative mass air flow integral from TPS 1 > 60.00 [-]	• Throttle adaption not active	• 0.01 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
		• Difference between TPS 1 and TPS 2 > 6.499° TPS		• 0.3 s • Continuous		
P0122 Throttle/Pedal Position Sensor/Switch "A" Circuit Low	Throttle Position Sensor 1 Short To Ground	• Throttle position sensor 1 voltage < 0.17 V		• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/Pedal Position Sensor/Switch "A" Circuit High	Throttle Position Sensor 1 Short To Battery Plus	• Throttle position sensor 1 voltage > 4.83 V		• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	O2 Sensor Circuit Bank 1 Sensor 1	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cutoff not active	• 12.0 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Short To Ground	• O2S sensor voltage < 0.15 V	• O2S heater front active • Pump current controller active • Measurement of WRAF sensor label resistor not active • Active phase of open circuit diagnosis for linear lambda sensor not active	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Short To Battery Plus	• O2S sensor voltage > 5.20 – 5.35 V	• O2S heater front active • Pump current controller active • Measurement of WRAF sensor label resistor not active • Active phase of open circuit diagnosis for linear lambda sensor not active	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Check	• Average check • Mean value of normalised signal amplitude >= 1.00 [-] • Or • Ratio check • Ratio of failed diagnostic cycle > n.a. [-]	• CONDITIONS RANGE 1: (Standard parameters) • General conditions • Time after engine start n.a. • ECT >= -48° C • Vehicle speed n.a. • Waiting for MAF integral is flown off after gear is changed n.a. • MAF 0.0 – 1,389.0 mg/rev • Integrated MAF in catalyst per cylinder n.a. • Static conditions • O2S front ready • Lambda stimulation active • Lambda control value -35.0 – 35.0% • Engine speed 928 – 3,008 RPM • MAF to activate diagnosis function 150.0 – 600.0 mg/rev • MAF per segment > 18.0 kg/h • Normalized integrated fuel mass in oil n.a. • Catalyst purge not active • Limited dynamic conditions • Integrated MAF after dynamic conditions are fulfilled < n.a. g • Dynamic engine speed < 150 RPM • Dynamic MAF < n.a. mg/rev	• 4.4 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Or • Dynamic MAF per segment < | 30.0 kg/h • Dynamic lambda < n.a. % • Change of dynamic torque < 0.07 [-] • CONDITIONS RANGE 2: (Diagnosis carried out together with the catalyst efficiency diagnosis) • General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 to 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 to 0.15 [-] • Or • Counter lambda controller deviation > 1.00 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Quickpass trim control ready • Or • Trim control with high demand of adaptation proportional part of trim control < 0.25 [-] • Lambda adaptation commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Temperature conditions • ECT > 60° C IAT > -48° C • Modeled catalyst temp. 500 to 700° C • Modeled catalyst temp. extended range 470 – 730° C • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Integrated MAF catalyst temp. conditions fulfilled n.a. • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0% • Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.00 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a.			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Normalised lambda controller value vs. modeled lambda value >= 1.00 [-]	• General conditions • O2S front ready • Time after engine start n.a. • MAF to activate diagnosis function n.a. • Integrated MAF per cylinder >= 0.42 – 2.0 kg • Vehicle speed n.a. • Static condition • Engine speed 1,056 – 3,008 RPM • MAF per cylinder 15.0 – 150.0 kg/h • Vehicle speed n.a. • Dynamic conditions • Dynamic engine speed < 288 RPM • Dynamic torque < 80.0 Nm • Absolute dynamic MAF < 70.0 kg/h • Activation due to canister purge • Canister purge no purge • Or • Canister purge not active • Or • Canister purge wait ramp open • Or • Canister purge min purge • And • Canister load known • Or			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Canister purge n.a. • And • Moving mean value canister load <= 1.80 [-]			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Functional Check	• O2S ceramic temp. < 730° C	• Stir up O2S heater front (linear) finished • For time >= 10.0 s	• 20.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0136 O2 Sensor Circuit Bank 1 Sensor 2	O2 Sensor Circuit Bank 1 Sensor 2	• Delta voltage one step at heater switching > 2.0 V • Number of checks >= 4	• Sensor voltage <= 0.40 V or 0.50 – 1.08 V.	• 40.0 s	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear Short To Ground	• O2S sensor voltage < 0.15 V	• O2S heater active	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear Short To Battery	• O2S sensor voltage > 5.2 – 5.35 V	• O2S heater active	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	O2 Sensor Circuit Slow Response Bank 1 Sensor 2	• EWMA filtered transient time at fuel cutoff > 0.0 s • In voltage range of 201 – 401.0 mV • Number of checks >= 3	• Rich voltage enable >= 547.9 mV • Lean voltage <= 201.2 mV • Fuel cutoff active • O2S rear ready • Modeled exhaust gas temp > 400° C • Front O2 sensor lambda signal > 2.0 V	• 100.0 s	• 1 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors Rear Response Check	• Gradient sensor voltage < 1,000.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 – 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• ECT > 60° C • IAT > -48° C • Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors Rear Response Check	• Gradient sensor voltage < 650.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 – 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• ECT > 60° C • IAT > -48° C • Modeled catalyst temp. 500 to 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors Rear Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 – 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• ECT > 60° C • IAT > -48° C • Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors Rear Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 – 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• ECT > 60° C • IAT > -48° C • Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear Open Circuit	• Internal resistance of O2S (binary) > 65,534.0 Ω		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear Out Of Range High	• Internal resistance of O2S (binary) 700.0 – 65,534.0 Ω	• Stir up O2S heater front (binary) finished • For time >= 10.0 s	• 20.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0149 Fuel Tim-	Injection Valves Supply Voltage	• Boost voltage < 30.0 V	• Engine running >= 0.3 s	• 3.6 s	• 2 DCY	– Check the Fuel Injectors . Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
ing Error	Out Of Range Low	• Boost voltage <= 50.0 V		• Continuous		⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Supply Voltage Out Of Range High	• Boost voltage > 75.0 V				
P0169 Incorrect Fuel Composition	Incorrect Fuel Composition	• Fuel quantity incorrect • Fuel correction factor incorrect • Internal check failed	• Engine speed > 1,200 RPM	• 0.52 – 2.08 s	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Replace the Engine Control Module -J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	• Lambda controller output > 35.0%	• Lambda control closed loop • Barometric pressure n.a. • Mass air flow > 60.00 mg/stk • Engine speed > 576 RPM • ECT @ cylinder block > 55° C • IAT at intake manifold > -48° C • AAT > -48° C	• 60.0 s • Continuous	• 2 DCY	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	• Lambda controller output < -35.0%	• Lambda control closed loop • Barometric pressure n.a. • Mass air flow > 60.00 mg/stk • Engine speed > 576 RPM • ECT @ cylinder block > 55° C • IAT at intake manifold > -48° C • AAT > -48° C • Oil dilution not detected • Counter > 100.0 [-] • Counter behavior: • Counter increment @ cold start 0.00 – 24.00 [-] • Or • Counter increment @ high load 1 [-] with: • Engine load > 50.0% • Engine speed > 1,792 RPM • For time 1.0 – 12.0 s • Counter decrement by time each 5.3 – 600.0 s with: • Modeled oil temperature >= 50° C	• 60.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Mod-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						ule J538 , Testing", page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
P0190 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel System Pressure Sensor High Pressure Side Short To Battery / Open Circuit	• High fuel pressure sensor voltage > 4.80 V		• 2.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	Fuel Rail High Pressure Side Out Of Range High	• Fuel pressure > 27,900.09 kPa	• Engine running • Engine speed < 8,160 RPM • Time after engine start > 5.0 s	• 5.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	Fuel System Pressure Sensor High Pressure Side Short To Ground	• High fuel pressure sensor voltage < 0.20 V		• 2.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • And • Injector low side voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector high side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Or • Injector voltage < 2.0 V • Injector low side switch current > 25.0 A • Injector voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0 CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Or • Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current > 25.0 A • Or • Power stage temperature > 150° C				
	Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.			
	Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • And • Injector low side voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector high side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Or • Injector voltage < 2.0 V • Injector low side switch current > 25.0 A • Injector voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Or • Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current > 25.0 A • Or • Power stage temperature > 150° C				
	Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.			
	Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • And • Injector low side voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector high side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Or • Injector voltage < 2.0 V • Injector low side current > 25.0 A • Injector voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Or • Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current > 25.0 A • Or • Power stage temperature > 150° C				
	Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.			
	Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • And • Injector low side voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector high side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Or • Injector voltage < 2.0 V • Injector low side switch current > 25.0 A • Injector voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 A • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Or • Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current > 25.0 A • Or • Power stage temperature > 150° C				
	Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.			
	Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/Performance	Throttle Position Sensor 2 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 2 >= 1.00 [-] • Or • Relative mass air flow integral from TPS 2 > 60.0 [-]	• Throttle adaption not active	• 0.01 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor 2 Short To Ground	• Throttle position sensor 2 voltage < 0.17 V		• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor 2 Short To Battery Plus	• Throttle position sensor 2 voltage > 4.83 V		• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0234 Turbocharger/Supercharger "A" Overboost Condition	Turbocharger Boost Pressure Control Out Of Range High	• Boost pressure > calculated max. plausible value • And • Boost pressure deviation < 209.90 – 265.0 kPa • Or • Turbocharger protection active	• Engine running • Accelerator pedal value > 0.0% • Fuel cut off n.a. • Difference between boost pressure and barometric pressure >= 20.0 kPa	• 1.3 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0236 Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance	Turbocharger Boost Pressure Sensor Cross Check	• Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Diff. BARO vs. MAP <= 7.50 kPa	• Case 1: Engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case 2: Engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. ——— • Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V	• 3.0 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0237 Turbocharger/Supercharger Boost Sensor "A" Circuit Low	Turbocharger Boost Pressure Sensor Short To Ground	• Turbocharger boost pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0238 Turbocharger/Supercharger Boost Sensor "A" Circuit High	Turbocharger Boost Pressure Sensor Short To Battery Plus	• Turbocharger boost pressure sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P025A Fuel Pump Module "A" Control Circuit/ Open	Fuel Pump Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • And • Signal voltage upper range (hardware values) < 2.84 – 3.25 V	• Commanded PWM 9.80 – 90.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P025C Fuel Pump Module "A" Control Circuit Low	Fuel Pump Short To Ground	• Signal voltage (hardware values) < 1.92 – 2.21 V	• Commanded PWM 9.80 – 90.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P025D Fuel Pump Module "A" Control Circuit High	Fuel Pump Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C • Or • Signal current (hardware values) > 0.1 – 0.18 A	• Commanded PWM 9.80 – 90.20% • Fuel pump commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • And • Injector driver high side switch current > 25 A (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • And • Injector driver low side switch current > 25 A (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 720° CRK • Continuous		
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time n.a.	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P0299 Turbocharger/Supercharger "A" Underboost Condition	Turbocharger Boost Pressure Control Out Of Range Low	• Boost pressure < calculated min. plausible value • And • Boost pressure deviation > 5.0 kPa	• Engine running • Turbo charger bypass valve closed • For time >= 1.0 s • Pressure ratio before charger set point > 1.30 [-] • For time >= 1.2 – 1.9 s • Engine speed > 2,208 – 2,750 RPM • Barometric pressure > 73.0 kPa • ECT > -10° C • No cylinder is shut off • Fuel tank level n.a.	• 4.0 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Leak to Intake Manifold Adaptive Value Check	• Turbo charger actuator set point >= 17.0 – 20.0%	• Engine running • Conditions: • For time >= 0.5 s • Difference between filtered boost pressure and basic boost pressure > 40.01 kPa • Difference between filtered boost pressure set point and basic boost pressure > 40.01 kPa • Boost pressure control deviation < 20.0 kPa boost pressure set point < 16.0 kPa • Actual boost pressure < 30.0 kPa • Difference between current boost pressure set point and basic boost pressure > 3.0 kPa • ECT > -20° C • IAT @ throttle > 0° C • Engine speed 2,500 – 6,800 RPM • Condition: • For time >= 5,000 ms • Difference between actual turbocharger speed and maximum turbocharger speed set point > 9,003 RPM • Conditions: • For time >= 1,000 ms • No gear shift • Fuel cut off not active	• 0.01 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation	• Number of cylinders with emission threshold misfire within 4,000 revolutions >= 2.0 [-] • Or • Number of cylinders with emission threshold misfire within 1,000 revolutions >= 2.0 [-]	• Emission threshold misfire detected	• 0.0 s • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Number of cylinders with catalyst damaging misfire >= 2.0 [-]	• Catalyst damaging misfire detected		• Immediately	with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation	• Catalyst damage misfire within 200 rev For A/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For DC/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For CV/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For M/T: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM • Time after engine start n.a. • And • Depending on transmission mode for M/T: • Engine load > 7.2 – 44.5% • For A/T: • Engine load > 8.0 – 43.0% • And • Depending on ECT @ cylinder block @ start	• 200 Rev. • Continuous	• Immediately	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within_1,000_rev For A/T: • emission threshold misfire rate (MR) > 2.25% • For DC/T: • Emission threshold misfire rate (MR) > 2.25% • For CV/T: • Emission threshold misfire rate (MR) > 2.25% • For MT: • Emission threshold misfire rate (MR) > 2.25%	• ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • Or • ECT @ cylinder block @ engine start > -48° C • And • Fuel cut off not active • Or • Single fuel cut off not active • Or • Number of fade out cylinders < 2.0 [-] • And • Dynamic manifold air pressure <= n.a. kPa • Dynamic throttle position <= n.a.° TPS/s	• 1,000 Rev. • Continuous	• 2 DCY	

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within_4,000_rev For A/T: • Emission threshold misfire rate (MR) > 2.40% • For DC/T: • Emission threshold misfire rate (MR) > 2.40% • For CV/T: • Emission threshold misfire rate (MR) > 2.40% • For M/T: • Emission threshold misfire rate (MR) > 2.40%	• And • Engine n.a. • Engine speed < n.a. RPM • Dynamic of ignition angle <= n.a. ° CRK • Or • Dynamic of ignition angle <= n.a. ° CRK • And • Rough road not detected	• 4 x 1,000 Rev. • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation	• Catalyst damage misfire within 200 rev For A/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For DC/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For CV/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For M/T: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM • Time after engine start n.a. • And • Depending on transmission mode for M/T: • Engine load > 7.2 – 44.5% • For A/T: • Engine load > 8.0 – 43.0% • And • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • Or	• 200 Rev. • Continuous	• Immediately	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within_1,000_rev For A/T: • emission threshold misfire rate (MR) > 2.25% • For DC/T: • Emission threshold misfire rate (MR) > 2.25% • For CV/T: • Emission threshold misfire rate (MR) > 2.25% • For MT: • Emission threshold misfire rate (MR) > 2.25%	• ECT @ cylinder block @ engine start > -48° C • And • Fuel cut off not active • Or • Single fuel cut off not active • Or • Number of fade out cylinders < 2.0 [-] • And • Dynamic manifold air pressure <= n.a. kPa • Dynamic throttle position <= n.a.° TPS/sec. • And • Engine n.a. • Engine speed < n.a. RPM • Dynamic of ignition angle <= n.a. ° CRK • Or • Dynamic of ignition angle <= n.a. ° CRK • And • Rough road not detected	• 1,000 Rev. • Continuous	• 2 DCY	and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/ or to appropriate repair manual. Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Emission threshold misfire within_4,000_rev For A/T: • Emission threshold misfire rate (MR) > 2.40% • For DC/T: • Emission threshold misfire rate (MR) > 2.40% • For CV/T: • Emission threshold misfire rate (MR) > 2.40% • For M/T: • Emission threshold misfire rate (MR) > 2.40%		• 4 x 1,000 Rev. • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation	• Catalyst damage misfire within 200 rev For A/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For DC/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For CV/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For M/T: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM • Time after engine start n.a. • And • Depending on transmission mode for M/T: • Engine load > 7.2 – 44.5% • For A/T: • Engine load > 8.0 – 43.0% • And • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • Or • ECT @ cylinder block @ engine start > -48° C • And • Fuel cut off not active • Or • Single fuel cut off not active • Or • Number of fade out cylinders < 2.0 [-] • And • Dynamic manifold air pressure <= n.a. kPa • Dynamic throttle position <= n.a.° TPS/sec.	• 200 Rev. • Continuous	• Immediately	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within_1,000_rev For A/T: • emission threshold misfire rate (MR) > 2.25% • For DC/T: • Emission threshold misfire rate (MR) > 2.25% • For CV/T: • Emission threshold misfire rate (MR) > 2.25% • For MT: • Emission threshold misfire rate (MR) > 2.25%		• 1,000 Rev. • Continuous	• 2 DCY	

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within_4,000_rev For A/T: • Emission threshold misfire rate (MR) > 2.40% • For DC/T: • Emission threshold misfire rate (MR) > 2.40% • For CV/T: • Emission threshold misfire rate (MR) > 2.40% • For M/T: • Emission threshold misfire rate (MR) > 2.40%	• And • Engine n.a. • Engine speed < n.a. RPM • Dynamic of ignition angle <= n.a. ° CRK • Or • Dynamic of ignition angle <= n.a. ° CRK • And • Rough road not detected	• 4 x 1,000 Rev. • Continuous		with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation	• Catalyst damage misfire within 200 rev For A/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For DC/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For CV/T: • Catalyst damaging misfire rate > 5.56 – 62.50% • For M/T: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM • Time after engine start n.a. • And • Depending on transmission mode for M/T: • Engine load > 7.2 – 44.5% • For A/T: • Engine load > 8.0 – 43.0% • And • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • Or	• 200 Rev. • Continuous	• Immediately	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within_1,000_rev For A/T: • emission threshold misfire rate (MR) > 2.25% • For DC/T: • Emission threshold misfire rate (MR) > 2.25% • For CV/T: • Emission threshold misfire rate (MR) > 2.25% • For MT: • Emission threshold misfire rate (MR) > 2.25%	ECT @ cylinder block @ engine start > -48° C • And • Fuel cut off not active • Or • Single fuel cut off not active • Or • Number of fade out cylinders < 2.0 [-] • And • Dynamic manifold air pressure <= n.a. kPa • Dynamic throttle position <= n.a.° TPS/sec. • And • Engine n.a. • Engine speed < n.a. RPM • Dynamic of ignition angle <= n.a. ° CRK • Or • Dynamic of ignition angle <= n.a. ° CRK • And • Rough road not detected	• 1,000 Rev. • Continuous	• 2 DCY	and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/ or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .
		• Emission threshold misfire within_4,000_rev For A/T: • Emission threshold misfire rate (MR) > 2.40% • For DC/T: • Emission threshold misfire rate (MR) > 2.40% • For CV/T: • Emission threshold misfire rate (MR) > 2.40% • For M/T: • Emission threshold misfire rate (MR) > 2.40%		• 4 x 1,000 Rev. • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/Performance	Engine Speed Input Circuit Performance	• Comparison of counted teeth vs reference = incorrect • Monitoring reference gap failure		• 1.5 s	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	Engine Speed Input Circuit No Signal	• Camshaft signal > 3 [-] • Engine speed no signal		• 2.5 s	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
P0324 Knock Control System Error	Knock Control System Error	• Signal fault counter (combustion) > 24 • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed 2,500 RPM	• 0.5 s	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0326 Knock /Combustion Vibration Sensor 1 Circuit Range/Performance Bank 1 or Single Sensor	Knock Sensor Rationality Check Low	• Difference between knock sensor signal and average knock sensor signal < 0.0 – 0.12 V	• ECT @ cylinder block > 60° C • MAF > 229.0 mg/stk	• 4.3 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0327 Knock /Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Out Of Range	• Sensor signal < 0.27 – 0.31 V	• ECT @ cylinder block > 60° C • MAF > 229.0 mg/stk • Engine speed > 2,016 RPM	• 4.0 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0328 Knock /Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock/Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	• Upper threshold > 1.0 V • Or for signal range check • > 15 – 115.87 V	• Engine speed > 1,000 RPM • Or for signal range check • ECT > 40.5° C • Engine load > 35 to 60% • Engine speed > 2,000 RPM	• 0.5 s	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0335 Crankshaft Position Sensor "A" Circuit	Crankshaft Position Sensor Activity Check	• Case 1: • Counted exhaust camshaft signals without synchronization >= n.a [-] • Or • Counted intake camshaft signals without synchronization >= n.a. [-] • Case 2: • Counted exhaust camshaft signals without synchronization n.a. • Or • Counted intake camshaft signals without synchronization >= 17.00 [-]	• Signal edges @ selected camshaft signal detected • Choice of: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • Or • Synchronization test incorrect • Or • Engine speed >= 380 RPM • Or • Engine running • Engine stalling >= 5.0 s • Or • Backwards rotation not detected • Or • Engine speed >= 400 RPM • Engine stop active	• 0.01 s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 .
	Crankshaft Position Sensor Out Of Range	• Pulse width backwards < 62; > 150 [µs] • For number of pulse widths outside tolerance > 1.00 [-] • Or • Pulse width forwards < 15; > 62 [µs] • For number of pulse widths outside tolerance > 1.00 [-]	• Engine speed > 32; < 1,200 RPM	• 1,800.0° CRK • Continuous		
P0336 Crankshaft Position Sen-	Crankshaft Position Sensor Rationality Check	• Crankshaft synchronization lost	• Engine running	• 2,160.0° CRK • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
sor "A" Circuit Range/Performance		• One or two additional teeth recognized incorrect • Or • One or two teeth missed	• Engine speed > 320 RPM	• 1,800.0° CRK • Continuous		Engine Speed Sensor G28 , Checking", page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 .
		• Sensor signal < 50 – 156 [µs] • And • Engine speed > 1,200 RPM • Or • Sensor signal < 30 µs • And • Engine speed <= 1,200 RPM	• Engine running	• 45,720.0° CRK • Continuous		
	Crankshaft Position Sensor Out Of Range	• Segment adaptation >= | 7.0%	• fuel cut off all cylinders active • segments in fuel cut-off mode >= 32.00 [-]	• 180.0° CRK • Continuous		
P0340 Camshaft Position Sensor "A" Circuit Bank 1 or Single Sensor	Camshaft Position Sensor Intake Signal Activity Check	• Signal change not detected • For number of reference gap >= 3.00 [-]	• Engine speed > 32 RPM	• 2,520.0° CRK • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Camshaft Position Sensor Intake Rationality Check	• Segment period ratio factor < 0.36; > 2.75 [-] • Or • Offset between camshaft and crankshaft < -79.0; > 15.0° CRK	• Engine speed > 32; < 8,160 RPM	• 952.5° CRK • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869
	Camshaft Position Sensor Intake Angular Offset Check	• Offset between camshaft and crankshaft < -79.0; > 15.0° CRK	• Engine speed > 32 RPM	• 450.0° CRK • Continuous		
	Camshaft Position Sensor Intake Signal Activity Check	• Segment time value < 50 µs	• Engine speed > 32; < 8,160 RPM	• 1,440.0° CRK • Continuous		
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	• Signal voltage low • Crankshaft signals = 8 [-]		• 0.5s	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	• Signal voltage high • Crankshaft signals = 8 [-]		• 0.5 s	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coil "A" Primary Control Circuit/Open	• Signal current 0.25 – -2.0 mA • Internal check failed	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coil "B" Primary Control Circuit/Open	• Signal current 0.25 – -2.0 mA • Internal check failed	• Engine speed > 680 RPM	• 2.0 s • Continuous .	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coil "C" Primary Control Circuit/Open	• Signal current 0.25 – -2.0 mA • Internal check failed	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0354 Ignition Coil "D" Primary Control Circuit/Open	Ignition Coil "D" Primary Control Circuit/Open	• Signal current 0.25 – -2.0 mA • Internal check failed	• Engine speed > 680 RPM	• 2.0 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P039B Cylinder 1 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 to 6,840.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Or • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time n.a.	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Or • Case 2: • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-] • Or • Case 3: • Ratio between filtered engine roughness and misfire detection threshold <= n.a. [-] • Or • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time n.a.			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03A5 Cylinder 2 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Or • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time n.a.	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 to 2.50 [-] • For time >= 540.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Or • Case 2: • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-] • Or • Case 3: • Ratio between filtered engine roughness and misfire detection threshold <= n.a. [-] • Or • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time n.a.			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03AF Cylinder 3 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Or • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time n.a.	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Or • Case 2: • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-] • Or • Case 3: • Ratio between filtered engine roughness and misfire detection threshold <= n.a. [-] • Or • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time n.a.			Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03B9 Cylinder 4 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Or • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time n.a.	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Or • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Or • Case 2: • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-] • Or • Case 3: • Ratio between filtered engine roughness and misfire detection threshold <= n.a. [-] • Or • Ratio between normalised engine roughness and misfire detection threshold <= n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Mass air flow > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time n.a.			Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Secondary Air System Functional Check	• Diff. pressure value after secondary air injection vs. pressure value before secondary air activation > 5.0 kPa	• General: • Secondary air pump ready • Catalyst heating active • Secondary air injection finished • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • And • Diff. barometric pressure vs. manifold pressure > n.a. kPa • Or • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0413 Secondary AIR System Switching Valve "A" Circuit Open	Secondary Air Valve Open Circuit	• Output voltage (hardware values) 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
P0414 Secondary AIR System Switching Valve "A" Circuit Shorted	Secondary Air Valve Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
	Secondary Air Valve Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) > 8.0 – 11.0 A	• Engine running • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection Pump Relay Open Circuit	• Output voltage (hardware values) 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System NMOG / NMHC / NOX Conversion Capability	• Cat efficiency (arithmetic average) > 1.00 [-]	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.00 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 sec. • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 to 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Number of checks 2.00 [-] • Temperature conditions	• 86.5 s • Once / DCY	• 2 DCY	– Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.32 Three Way Catalytic Converter, TWC Checking”, page 914 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• ECT > 60° C • IAT > -48° C • Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 to 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF < 25.01 mg/stk • Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.00 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P043E EVAP System Leak Detection Reference Orifice Low Flow	EVAP System Out Of Range High	• Evap pump current during reference measurement > 40.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 to 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P043F EVAP System Leak Detection Reference Orifice High Flow	EVAP System Out Of Range Low	• Evap pump current during reference measurement < 15.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 to 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP Purge Valve Functional Check: Stuck Close	• Ratio actual intake manifold pressure and modeled set point intake manifold pressure < 0.05 [-]	• ECT @ cylinder block > 58° C • Barometric pressure > 73.0 kPa • AAT > 5° C • AAT @ start >= 5° C • Diff. barometric pressure vs. filtered intake manifold pressure > n.a. kPa • Diff. barometric pressure vs. filtered intake manifold pressure > 25.0 – 40.0 kPa • Ratio MAF @ intake manifold and MAF max. > 0.07 – 0.09 [-] • Engine speed 1,180 – 2,800 RPM • Vehicle speed >= 5 km/h • Diff. engine speed vs. filtered engine speed < 90 RPM • Diff. ratio MAF @ intake manifold and MAF max vs. ratio filtered MAF @ intake manifold and MAF max < 0.15 [-] • Diff. modeled intake manifold pressure vs. filtered modeled intake manifold pressure < 1.50 kPa • And • Integrated MAF since engine start >= 0.0 – 5,000.0 g • Lambda control active • Lambda control value -30.0 – 30.0%	• 8.5 s • Once / DCY	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S front 0.95 – 1.05 [-] • Case 1: • Integrated MAF @ canister purge per driving cycle >= n.a. g • Case 2: • Integrated MAF @ canister purge valve >= 2.1 g • Ratio MAF @ canister purge and MAF per cylinder n.a. • And • Depending on AAT: • AAT >= 30° C • Canister load <= 0.09 [-] • Or • AAT >= 20; < 30° C • Canister load <= 0.09 [-] • Or • AAT < 20° C • Canister load <= 0.27 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Rationality Check	• Difference pump current vs. rough leak reference current < 0 mA • And • For time >= 600.0 s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) > 3.13; <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0445 EVAP System Purge Control Valve "A" Circuit Shorted	EVAP Purge Valve Short To Ground	• Output voltage (hardware values) 1.92 – 2.21 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
	EVAP Purge Valve Short To Battery Plus	• Actuator temperature 160 – 200° C • Or • Output current (hardware values) > 4.0 – 7.0 A	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) >= 3.13% • Actuator commanded on			
P0447 EVAP System Vent Control Circuit Open	EVAP Leak Detection Pump Valve Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range (hardware values) 2.75 – 3.36 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0448 EVAP System Vent Control Circuit Shorted	EVAP Leak Detection Pump Valve Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
	EVAP Leak Detection Pump Valve Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) > 1.0 – 2.0 A	• Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected (Large Leak)	EVAP System Leak Detected (Large Leak)	• Time for pressure drop < 1.0 s	• Time after engine start 12 – 65,530 sec. • ECT 5 – 120° C • ECT at start 5 – 50° C • Engine off time > 21,600 s. • Ambient air temp 5 – 59° C • Ambient air temp drop after start < 12° K • Intake manifold vac. > -2,560 hPa • Altitude < 2,700 m • Veh. speed >= 0 • Veh speed once > 40 km/h • Any drive gear • Restart temp diff. > 0° K • Purge valve closed • LDP active	• 136.0 s	• 2 DCY	– Check the EVAP System for leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Rationality Check	• Difference pump current vs. small leak reference current < 0 mA • And • Pump current measurement time > 600.0 s • And • Pump current gradient >= 0.30; <= 0.01 mA/s • Pump current gradient n.a.	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Evap purge adaptation < 0.30 [-] • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Difference pump current vs. small leak reference current >= 0 mA • And • Pump current gradient n.a. • And • Ratio between actual pump current and small leak reference pump current < 1.10 [-]				tion Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
		• Difference pump current vs. small leak reference current >= 0 mA • And • Pump current gradient >= 0.30; <= 0.01 mA/s				
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP System Purge Control Valve "A" Circuit Low	• Signal voltage 0 – 3.26 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP System Purge Control Valve "A" Circuit High	• Signal current > 2.2 A	• EVAP purge valve commanded On • Engine speed > 80 RPM	• 0.5 s	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air System Functional Check	• Case 1: • Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.51 [-] • Or • Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.51 [-] • Case 2: • Diff. expected integrated secondary air pressure pulsations and actual integrated secondary air pressure pulsations > n.a. kPa/s • Case 3: • Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.03 [-] • Or • Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.03 [-]	• General: • Secondary air pump active • Catalyst heating active • Secondary air injection active • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • And • Diff. barometric pressure vs. manifold pressure > n.a. kPa • Or • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.29 Secondary Air Injection Sensor 1 G609 , Checking", page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ "3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking", page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ "3.6.31 Secondary Air System GX24 , Checking", page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0501 Vehicle Speed Sensor "A" Circuit Range/Performance	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor fault value: out of range high failure • Speed sensor fault value: out of range low failure • Speed sensor fault value: rationality check high failure • Speed sensor fault value: rationality check low failure		• 0.5 s • Continuous	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ "3.6.35 Vehicle Speed Signal, Checking", page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
P0502 Vehicle Speed Sensor "A" Circuit Low	Vehicle Speed Sensor Electrical Check	• Vehicle speed sensor signal: electrical error failure		• 0.5 s • Continuous	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ "3.6.35 Vehicle Speed Signal, Checking", page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
P0503 Vehicle Speed Sensor "A" Circuit Intermittent/Erratic/High	Vehicle Speed Sensor "A" Circuit Intermittent/Erratic/High	• Vehicle speed > 290 km/h		• 0.5 s	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ "3.6.35 Vehicle Speed Signal, Checking", page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Torque safety limitation not active • Driver request not active • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start n.a. • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • And • Set point change < n.a. RPM • For time >= n.a. s • And • Additional conditions: • For time n.a. • Gear switch not active (automatic transmission only) • Or • Driver request not active • Or • Vehicle speed 0 km/h • And • Engine load (manual transmission only) < 30.47%	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 200 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed =0 km/h • Torque safety limitation not active • Driver request not active • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start n.a. • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • And • Set point change < n.a. RPM • For time >= n.a. sec. • And • Additional conditions: • For time n.a. • Gear switch not active (automatic transmission only) • Or • Driver request not active • Or • Vehicle speed 0 km/h	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Idle Controller Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 200 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed =0 km/h • Torque safety limitation not active • Driver request not active • Throttle actuator commanded on • Evap purge flow < 8.00 kg/h • Engine running • Time after engine start n.a. • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • And • Set point change < n.a. RPM • For time >= n.a. s • And • Additional conditions: • For time n.a. • Gear switch not active (automatic transmission only) • Or • Driver request not active • Or • Vehicle speed 0 km/h	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed =0 km/h • Torque safety limitation not active • Driver request not active • Throttle actuator commanded on • Evap purge flow < 8.00 kg/h • Engine running • Time after engine start n.a. • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • And • Set point change < n.a. RPM • For time >= n.a. s • And • Additional conditions: • For time n.a. • Gear switch not active (automatic transmission only) • Or • Driver request not active • Or • Vehicle speed 0 km/h • And • Engine load (manual transmission only) < 30.47%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Ignition Control Ignition Timing Monitor @ Idle	• Difference between commanded ignition timing efficiency vs. actual value > 20.0%	• Catalyst heating @ idle active • Commanded ignition timing efficiency during catalyst heating <= 80.0% • Fuel-fed overrun active • Or • Engine idle • Pressure ratio @ throttle <= 1.0 [-] • Delta mass air flow set point n.a. • Delta engine speed n.a. • Vehicle speed 0 km/h	• 6.0 s • Once / DCY	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	VVT Actuator Intake Rationality Check	• Camshaft position deviation > 9.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position n.a. • Camshaft position adjustment active • Catalyst heating active	• 0.0 (FTP75:45.0) s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P053F Cold Start Fuel Pressure Performance Bank 2	Fuel System Out Of Range Low	• Deviation between set point and actual fuel pressure > 1,500.20 kPa • For time >= 3.0 s	• General: • Engine speed > 608 RPM • And • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s • And	• 5.0 s • Once / DCY	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel System Out Of Range High	• Deviation between set point and actual fuel pressure < -1,500.20 kPa • For time >= 3.0 s	• Fuel mass set point upper range < 100.32 – 172.41 mg/rev • Or • Fuel mass set point gradient n.a. • For time n.a. • And • Additional for catalyst heating: • Catalyst heating active • ECT @ cylinder block > -48° C • Time after engine start > 3.0 s • Fuel mass set point lower range >= 5.00 mg/rev • For time >= 3.0 s			– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P056E Cold Start Turbocharger/Supercharger Boost Control "A" Performance	Turbocharger Boost Pressure Control Valve Functional Check - Slow Response	• Boost pressure actuator position controller output > 98.0% • Boost pressure actuator position controller output < -98.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Catalyst heating active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 . – Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger Boost Pressure Control Valve Functional Check	• Deviation boost pressure actuator position controller > 12.0 – 100.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Difference between actuator position set point in normal mode and during catalyst heating > 0.0% • Catalyst heating active • Boost pressure control active			Pressure Sensor G31 , Checking”, page 863 .
P05A0 Active Grille Air Shutter "A" Stuck On	Active Grille Air Shutter Functional Check	• Blocked active grille air shutter detected • Functional check uncontrolled adjustment detected	• AAT n.a.	• 0.3 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05A2 Active Grille Air Shutter "A" Control Circuit/ Open	Active Grille Air Shutter Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • Signal voltage upper range < 2.85 – 3.25 V		• 0.5 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05A3 Active Grille Air Shutter "A" Control Circuit Range/Perfor-	Active Grille Air Shutter Functional Check	• Internal logic failure detected • initialization failure detected		• 0.3 s • Continuous • 0.0 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
mance	Active Grille Air Shutter Activity Check	• Active grille air shutter controller feedback signal failed		• 24.0 s • Continuous		
P05A4 Active Grille Air Shutter "A" Control Circuit High	Active Grille Air Shutter Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C Or • Signal current > 4.0 – 7.0 A		• 0.5 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05A5 Active Grille Air Shutter "A" Control Circuit Low	Active Grille Air Shutter Short To Ground	• Signal voltage < 1.92 – 2.21 V	• Recording time of signal voltage > 3.3 s • Active grille air shutter feedback failure not detected	• 0.5 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05C0 Active Grille Air Shutter Module "A" Over Temperature	Active Grille Air Shutter Functional Check	• Internal over voltage detected • Internal overtemperature detected		• 0.3 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P0601 Internal Control Module Memory Check sum Error	ECM: Checksum Verification	• Calibration checksum incorrect • Software checksum incorrect		• 1.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0603 Internal Control Module Keep Alive Mem-	ECM: Communication Check	• SPI communication with ATIC failure		• 2.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
ory (KAM) Error	ECM: Injection Valves Internal Hardware Check	• Hardware vs. software version check during initialization failure		• 4.9 s • Once / DCY		
		• Calibration during initialization failure				
		• Hardware during initialization failure				
		• Time reference from microcontroller during initialization failure				
		• Communication between microcontroller and SDI-Driver power-stage failure		• 2880.0° CRK • Continuous • 360.0° CRK • Once / DCY		
		• Time reference from microcontroller during initialization missing		• 2880.0° CRK • Continuous		
		• Communication between microcontroller and SDI-Driver power-stage failed		• 4320.0° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0606 Control Module Processor	Barometric Pressure Sensor Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Case 2: Non charged engine • Diff. BARO mean value vs. MAP mean value >= n.a. kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value BARO @ ECM keep alive time and MAP @ ECM keep alive time) > n.a. kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value BARO @ ECM keep alive time and MAP @ ECM keep alive time) <= n.a. kPa	• Case A: Engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case B: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module -J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 to 6,553.5 sec. • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Barometric Pressure Sensor Out OF Range High	• Measured barometric pressure > 115.0 kPa		• 5.0 s • Continuous		
	Barometric Pressure Sensor Out OF Range Low	• Measured barometric pressure < 45.0 kPa				
	Knock Control Internal Hardware Check	• Knock control malfunction: signal acquisition error	• Engine running	• 6.4 s • Continuous		
	ECM: EEPROM Check	• EEPROM information failure		• 1.0 s • Continuous		
				• 1.0 s • Once / DCY		
	ECM: Random Access Memory (RAM) Internal Hardware Check	• RAM error detected	• Microcontroller failure • Reset counter > 1.0 [-]	• 0.04 s • Once / DCY		
	ECM: Random Access Memory (RAM) Functional Check			• 0.01 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	ECM: A/D Converter Function Monitoring: A/D Converter	• Diff. A/D-channel 1 vs. A/D channel 2 > 0.30 V		• 0.5 s • Continuous		
	ECM: Communication Check	• SPI communication with ATIC failed	• Time after ignition on >= 1.0 s	• 10.0 s • Continuous		
		• SPI communication with ATIC implausible				
	ECM: Electronic Throttle Control Module Function Monitoring: Torque	• Monitoring of difference between actual and set point torque value engine torque overflow > 45.0 – 350.0 Nm	• Throttle actuator commanded on	• 0.5 s • Continuous		
		• Monitoring of torque difference integration integrated engine torque > 550.0 Nms		• 0.01 s • Continuous		
	ECM: Electronic Throttle Control Module Function Monitoring: Engine Speed Limitation	• Engine speed > 1,760 RPM	• Engine speed limitation active • Injection active	• 0.5 s • Continuous		
	ECM: Electronic Throttle Control Module Function Monitoring: A/D Converter	• Internal check failed		• 0.04 s • Continuous		
P0607 Control Module Performance	Barometric Pressure Sensor Short To Ground	• Barometric pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Barometric Pressure Sensor Short To Battery Plus	• Barometric pressure sensor voltage > 4.80 V				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P062B Internal Control Module Fuel Injector Control Performance	Internal Control Module Fuel Injector Control Performance	• Internal logic failure	• Engine speed > 80 RPM	• 2.2 s	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0634 Control Module Internal Temperature "A" Too High	Turbocharger Boost Pressure Control Valve Over Temperature	• Bypass valve driver temperature (hardware values) > 170 – 190° C	• Control valve commanded on	• 0.4 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Basic Settings Adaptation Value Monitoring	• Battery voltage <= 9.04 V	• TPS adaptation commanded on	• 0.01 s • Once per lifetime	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Basic Settings Adaptation Value Monitoring (Start Check)	• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V	• Throttle start check active • Accelerator pedal value < 99.9% • Engine speed < 64 RPM	• 0.01 s • Once / DCY		
		• Difference between actual throttle and reference position > 0.503° TPS	• Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 101° C			
	Throttle Actuator Basic Settings Adaptation Value Monitoring (Top Limit)	• Difference between actual throttle and reference position > 0.503° TPS	• Throttle adaption active • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V	• IAT > 5° C • ECT 5 – 101° C			
	Throttle Actuator Basic Settings Adaptation Value Monitoring (Bottom Limit)	• Difference between actual throttle and reference position > 0.503° TPS				
		• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V				
	Throttle Actuator Basic Settings Adaptation Value Monitoring (Mechanical Stop Low)	• TPS 1 voltage < 0.40; > 0.80 V • Or • TPS 2 voltage < 4.20; > 4.60 V				
	Throttle Actuator Basic Settings Adaptation Value Monitoring (Limp Home Position)	• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.25 V				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Basic Settings Adaptation Value Monitoring	• Accelerator pedal value > 99.9% • Or • Engine speed > 64 RPM • Or • Vehicle speed > 2 km/h • Or • IAT @ throttle < 5° C • Or • ECT @ cylinder block < 5° C • Or • ECT @ cylinder block > 101° C	• TPS adaptation commanded on	• 0.01 s • Once per lifetime		
P0641 Sensor Reference Voltage "A" Circuit/Open	Sensor Reference Voltage "A" Circuit/Open	• Signal voltage deviation > +/- 0.3 V		• 0.5 s	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0642 Sensor Reference Voltage "A" Circuit Low	ECM: 5V Supply Voltage Out Of Range Low	• Analog output 1 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0643 Sensor Reference Voltage "A" Circuit High	ECM: 5V Supply Voltage Out Of Range High	• Analog output 1 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0651 Sensor Reference Voltage "B" Circuit/ Open	Sensor Reference Voltage "B" Circuit/Open	• Signal voltage deviation > +/- 0.3 V		• 0.5 s	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0652 Sensor Reference Voltage "B" Circuit Low	ECM: 5V Supply Voltage Out Of Range Low	• Analog output 2 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0653 Sensor Reference Voltage "B" Circuit High	ECM: 5V Supply Voltage Out Of Range High	• Analog output 2 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0657 Actuator Supply Voltage "A" Circuit/ Open	Supply Voltage Relay Engine Components Open Circuit	• Output voltage lower range >= 1.90 – 2.30 V • Output voltage upper range (hardware values) <= 2.80 – 3.20 V	• Relay commanded off	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0658 Actuator Supply Voltage "A" Circuit Low	Supply Voltage Relay Engine Components Short To Ground	• Output voltage (hardware values) < 1.90 – 2.28 V	• Relay commanded off	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0659 Actuator Supply Voltage "A" Circuit High	Supply Voltage Relay Engine Components Short To Battery Plus	• Output current > 1.0 – 2.3 A • Or • Actuator temperature (hardware values) > 175 – 195° C	• Relay commanded on	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0686 ECM/ PCM Power Relay Control Circuit Low	Main Relay Rationality Check During Engine Off	• Sensed circuit voltage > 6.0 V	• Main relay commanded off • For time >= 0.3 s	• 0.1 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
	Main Relay Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Relay commanded off • For time > 40 ms	• 0.2 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0687 ECM/ PCM Power Relay Control Circuit High	Main Relay Rationality Check During Engine On	• Sensed circuit voltage < 5.0 V	• Main relay commanded on • For time >= 0.1 s	• 0.1 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ "3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking", page 892 .
	Main Relay Short To Battery Plus	• Main relay driver temperature > 175 – 195° C • Or • Main relay output current > 1.0 – 2.3 A (hardware values)	• Main relay commanded on • For time >= 0.4 s	• 0.2 s • Continuous		
P0697 Sensor Reference Voltage "C" Circuit/ Open	Sensor Reference Voltage Circuit Open	• Signal voltage deviation > +/- 0.3 V		• 0.5 s	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0698 Sensor Reference Voltage "C" Circuit Low	ECM: 5V Supply Voltage Out Of Range Low	• Analog output 3 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0699 Sensor Reference Voltage "C" Circuit High	ECM: 5V Supply Voltage Out Of Range High	• Analog output 3 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	• I portion of 3rd lambda control loop > 0.030	• Engine speed 1,200 – 4,000 RPM • Modeled exhaust gas temp 350 – 1,000 °C • Engine load 21.8 – 99.8% • 1st, 2nd, 3rd lambda control in closed loop • O2S rear and heater ready, no faults	• 1,800 s	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A1 Fuel Rail Pressure Sensor Inappropriately Low	Fuel System Pressure Sensor, High Pressure Side Rationality Check Low	• Fuel mass controller output < -45.0% • And • High pressure controller output > 8 mg	• Engine speed > 608 – 1,088 RPM • Mass fuel flow set point 1.99 – 20.01 mg/rev • For time after request for mass fuel flow set point >= 5.0 s • Time after change to DFI n.a. • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating n.a. • Full load n.a. • Catalyst purge n.a. • Lambda control closed loop • Evap purge functionality diagnosis n.a. • And • Choice of: • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A2 Fuel Rail Pressure Sensor Inappropriately High	Fuel System Pressure Sensor, High Pressure Side Rationality Check High	• Fuel mass controller output > 30.0% • And • High pressure controller output < -10 mg	• Engine speed > 608 – 1,088 RPM • Mass fuel flow set point 4.01 – 29.99 mg/rev • For time after request for mass fuel flow set point >= 5.0 s • Time after change to DFI n.a. • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating n.a. • Full load n.a. • Catalyst purge n.a. • Lambda control closed loop • Evap purge functionality diagnosis n.a. • And • Choice of: • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A4 Fuel Rail Pump Control Valve Stuck Closed	Fuel System Pressure Sensor, High Pressure Side Out Of Range High	• Deviation between fuel pressure set point and current fuel pressure < -2,000.10 kPa • – • Case 1: • High pressure controller output < -30 mg • Flow control valve open • Mass fuel flow set point > 15.01 mg/stk	• Engine speed > 608 – 6,816 RPM • Mass fuel flow set point 15.01 – 1,389.0 mg/rev • For time after request for mass fuel flow set point >= 5.0 s • Engine start not active • Time after engine start > 5.0 s • Engine warm-up n.a. • Catalyst heating not active • Full load n.a. • Catalyst purge n.a. • Lambda control n.a. • Evap purge functionality diagnosis n.a. • And • Choice of: • Canister load <= n.a. [-] • Or • Evap purge valve n.a.	• 5.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 . – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 .
P13EA Cold Start Ignition Timing Performance Off Idle	Ignition Control Ignition Timing Monitor @ Part Load	• Difference between commanded ignition timing efficiency vs. actual value > 12.0%	• Catalyst heating @ part load active • Commanded ignition timing efficiency during catalyst heating <= 88.0% • Engine part load • Delta mass air flow set point n.a. • Delta engine speed n.a. • Vehicle speed > 2 km/h	• 5.0 s • Once / DCY	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P150A Engine Off Timer Performance	Engine Off Timer Performance	• Difference between engine off time and ECM after run time < -12 s or > 12 s	• Key on after ECM after run time active • Key on during ECM after run time active • CAN active	• 6.0 s	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1545 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Out Of Range	• Control duty cycle > 98.0%	• Throttle position not at min. value • Throttle adaptation not active • Throttle actuator commanded on	• 0.7 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Rationality Check	• Difference between throttle position set point and throttle flap opening angle for electronic throttle control > 2.998 – 24.982° TPS	• Throttle adaptation not active • Throttle actuator commanded on • Difference between throttle position set point and throttle flap opening angle <= 1.999; > -1.999° TPS	• 0.5 s • Continuous		
P1609 Crash Shut-Off Was Triggered	Airbag Safety Measures Due To Crash With Airbag Activation	• Airbag(s) activated		• 0.0 s • Continuous	• 2 DCY	– After proper repair of damage, erase the Engine Control Module - J623- DTC. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P169A Loading Mode Active	ECM: Transport Mode Function Monitoring: Mode Change	• Transport mode active	• Vehicle speed < 5 km/h • Max trip mileage since initial vehicle start-up < 100.0 km during ECM keep alive-time after ignition off • Engine speed 0 RPM • Production mode not active • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY	– Vehicle is in Transport Mode (Loading Mode). It can be turned off with a scan tool or will automatically switch off after approximately 100 km (62.15 miles) have accumulated on the vehicle. May need to perform readiness check. Refer to ⇒ “3.2 Readiness Code”, page 14 .
P2004 Intake Manifold Runner Control Stuck Open Bank 1	Intake Manifold Runner Flap Actuator Stuck Open	• Signal voltage > 0.70 V • For time >= 1.5 s	• Flap commanded off • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2006 Intake Manifold Runner Control Stuck Closed Bank 1	Intake Manifold Runner Flap Actuator Stuck Close	• Signal voltage < 0.70 V • For time >= 1.5 s	• Flap commanded on • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2008 Intake Manifold Runner Control Circuit/Open Bank 1	Intake Manifold Runner Flap Actuator Open Circuit	• Output voltage lower range 1.92 – 2.21 V • Output voltage upper range (hardware values) 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2009 Intake Manifold Runner Control Circuit Low Bank 1	Intake Manifold Runner Flap Actuator Short To Ground	• Output voltage (hardware values < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2010 Intake Manifold Runner Control Circuit High Bank 1	Intake Manifold Runner Flap Actuator Short To Battery Plus	• Power stage temperature > 160 – 200° C • Or • Output current (hardware values) > 4.0 – 7.0 A	• Engine running • Actuator commanded on	• 2.0 s • Continuous •	• 2 DCY	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2014 Intake Manifold Runner Position Sensor/Switch Circuit Bank 1	Intake Manifold Runner Flap Position Sensor Short To Ground / Open Circuit	• Intake manifold runner flap position sensor voltage < 0.20 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2015 Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance Bank 1	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance Bank 1	• Deviation runner flap target position vs actual position > 25% • Actual position 0 – 100%	• Flap commanded on or off • Adaptation ready	• 1.5 s	• 2 DCY	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2016 Intake Manifold Runner Position Sensor/Switch Circuit Low Bank 1	Intake Manifold Runner Position Sensor/Switch Circuit Low Bank 1	• Signal voltage < 0.25 V		• 0.3 s	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2017 Intake Manifold Runner Position Sensor/Switch Circuit High Bank 1	Intake Manifold Runner Flap Position Sensor Short To Battery Plus	• Intake manifold runner flap position sensor voltage > 4.80 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Output voltage hardware values) < 1.92 – 2.21 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Power stage temperature > 160 – 200° C • Or • Output current (hardware values) > 8.0 – 12.0 A	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	• Adaption value < -0.05 [-]	• 2nd lambda control closed loop • Cat purge not active • Combustion mode change not active • Engine speed >= 704 RPM • Integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • Or • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	• Adaption value > 0.05 [-]	• 2nd lambda control closed loop • Cat purge not active • Combustion mode change not active • Engine speed >= 704 RPM • Integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • Or • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2100 Throttle Actuator "A" Control Motor Circuit/ Open	Throttle Actuator Open Circuit	• Electronic throttle valve driver load resistance > 200.0 kΩ	• Difference between measured and filtered throttle position <= 119.50° TPS • Actuator commanded off	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Over Temperature	• Electronic throttle valve driver temperature (hardware values) > 170.0 – 190.0° C	• Actuator commanded on	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P2103 Throttle Actuator "A" Control Motor Circuit High	Throttle Actuator Short Circuit	• Electronic throttle valve driver current commanded on (hardware values) > 9.3 – 15.0 A	• Actuator commanded on	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Control System - Forced Limited Power	• Internal check failed	• Duty cycle > 80% or deviation throttle value angles vs. calculated value > 4 – 50%	• 0.5 – 5.0 s	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position Sensor 1 Out Of Range Low	• Signal voltage sensor 1 < 0.39 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position Sensor 1 Out Of Range High	• Signal voltage sensor 1 > 4.86 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position Sensor 2 Out Of Range Low	• Signal voltage sensor 2 < 0.19 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Pedal Position Sensor 2 Out Of Range High	• Signal voltage sensor 2 > 2.80 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position Sensor 1 and 2 Rationality Check	• Difference between signal voltage sensor 1 and sensor 2 > 0.10 – 0.12 V		• 0.4 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2146 Fuel Injector Group "A" Supply Voltage Circuit/Open	Fuel Injector Group "A" Supply Voltage Circuit/Open	• Signal current < 2.6 A • Or • Signal current > 14.90 A	• Engine speed > 80 RPM • Or • Low side signal current > 2.70 A	• 0.5 s	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
P2149 Fuel Injector Group "B" Supply Voltage Circuit/Open	Fuel Injector Group "B" Supply Voltage Circuit/Open	• Signal current < 2.6 A • Or • Signal current > 14.90 A	• Engine speed > 80 RPM • Or • Low side signal current > 2.70 A	• 0.5 s	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value >= 28.0%	• Air mass > 60.00 mg/stk • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Mass fuel flow 17.99 – 51.02 mg/stk • Engine speed 1,280 – 4,000 RPM • And • Evap purge valve closed • Or • Canister load <= 1.20 [-] • Evap purge flow at max. value • Or • Dependence on canister purge min: • Lower limit of lambda controller output n.a. • Or • Upper limit of lambda controller output n.a. • And • Evap purge flow at min. value	• 5.0 s • Continuous .	• 2 DCY	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						Testing”, page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value <= 25.0%	• Air mass > 60.00 mg/stk • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 to 200.0 g • Mass fuel flow 17.99 – 51.02 mg/stk • Engine speed 1,280 – 4,000 RPM • And • Evap purge valve closed • Or • Canister load <= 1.20 [-] • Evap purge flow at max. value • Or • Dependence on canister purge min: • Lower limit of lambda controller output n.a. • Or • Upper limit of lambda controller output n.a. • And • Evap purge flow at min. value	• 5.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899. – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Cooling System Performance Not In The Expected Range	• Case 1: • Cooling system temperature too low after a sufficient mass air flow (indication by a mass air flow based temperature model) < 66 – 76° C • Or • Case 2: • Filtered ECT decreases under a threshold value after reaching a high temperature level < 61° C • For time n.a.	• Case 1: • ECT @ first start (lower threshold) >= -10° C • ECT @ first start (upper threshold) <= 47 – 57° C • AAT > -10° C • Start of fault decision: • Modeled ECT > 66 – 76° C • Conditions at fault decision: • Accum. fuel cut off time since first Engine start <= 10.20% • Accum. start-stop time since first engine start <= 16.0% • Accum. minimum load and maximum load time since first engine start <= 39.80% • For relative MAF > 40.0% • Or • Relative MAF <= 2.50% • Accum. maximum vehicle speed time since first engine start <= 14.80% • For vehicle speed > 120 km/h • Case 2: • ECT exceeds a threshold value > 65° C • AAT > -10° C • ECT @ first start (lower threshold) >= -40° C • ECT @ first start (upper threshold) <= 215° C	• 0.0 (Unified 430.0) s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the After-Run Coolant Pump - V51- . Refer to ⇒ “3.6.2 After-Run Coolant Pump V51 , Checking”, page 851 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Conditions for time: • Relative MAF > 5.0% • Vehicle speed n.a. • Modeled ECT > 65° C • Engine stop counter < 255.00 [-] • For time >= 15.0 s			
P2183 Engine Coolant Temperature Sensor 2 Circuit Range/Performance	Engine Coolant Temperature Sensor @ Radiator Outlet Cross Check	• Diff. ROT vs. IAT @ first engine start > 20 K (depending on engine off time) • And • Diff. ROT vs. AAT @ first engine start > 20 K (depending on engine off time) • And • Diff. AAT vs. IAT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure an cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. AAT vs. min. AAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Engine Coolant Temperature Sensor @ Radiator Outlet Short To Ground	• Sensor voltage < 0.30 V		• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Engine Coolant Temperature Sensor @ Radiator Outlet Short To Battery / Open Circuit	• Sensor voltage > 4.90 V	• IAT @ throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Case 1: • Adaptive value >= 2.40 mg/stk • Case 2: • Adaptive value >= n.a. kg/h	• Air mass > 60.0 mg/stk • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Driver request low dynamics • And • Mass fuel flow lower range n.a. • Mass fuel flow upper range < 0.00 – 17.0 mg/stk • Engine speed 704 – 992 RPM • Or • Engine n.a. • And • Evap purge valve closed • Or • Canister load <= 1.20 [-] • Evap purge flow at max. value • Or • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Or • Upper limit of lambda controller output n.a.	• 5.0 s • Continuous	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Evap purge flow at min. value			– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Case 1: • Adaptive value <= -2.40 mg/stk • Case 2: • Adaptive value <= n.a. kg/h	• Air mass > 60.0 mg/stk • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Driver request low dynamics • And • Mass fuel flow lower range n.a. • Mass fuel flow upper range < 0.00 – 17.0 mg/stk • Engine speed 704 – 992 RPM • Or • Engine n.a. • And • Evap purge valve closed • Or • Canister load <= 1.20 [-] • Evap purge flow at max. value • Or • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Or • Upper limit of lambda controller output n.a.	• 5.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• And • Evap purge flow at min. value			GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Rationality Check	• Lambda value > 1.15 [-] • And • O2S signal rear >= 0.88 V	• O2S front ready • O2S rear ready • ECT @ cylinder block >= -48° C • MAF > 15.0; < 300.0 kg/h • Catalyst purge not active • Integrated MAF after end of catalyst purge 0 [-] • Engine speed > 1,152 RPM • EGT @ O2S front > -273; < 800° C • Combustion mode change not active • Integrated MAF > 40.0 g • Dynamic lambda controller output < 3.5% • Dynamic MAF < 0.08 g/rev • Dynamic engine speed < 200 RPM • And • Case 1: • MAF 0.05 – 0.75 g/rev • Engine speed 576 – 4,512 RPM • Or • Case 2: • Catalyst efficiency diagnosis active	• 72.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Lambda set value 1.00 [-] • And • O2S signal front < 1.06 [-]	• Fuel cut off not active • Engine running • And • Choice of: • Fuel trim diagnosis failure detected • Or • O2S rear sensor plausibility failure detected • And • Choice of: • Lambda adaptation value >= 0.12 [-] • Or • Lambda adaptation value <= -0.12 [-]	• 0.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Rationality Check	• Lambda value < 0.85 [-] • And • O2S signal rear <= 0.25 V	• O2S front ready • O2S rear ready • ECT @ cylinder block >= -48° C • MAF > 15.0; < 300.0 kg/h • Catalyst purge not active • Integrated MAF after end of catalyst purge 0 [-] • Engine speed > 1,152 RPM • EGT @ O2S front > -273; < 800° C • Combustion mode change not active • Integrated MAF > 40.0 g • Dynamic lambda controller output < 3.5% • Dynamic MAF < 0.08 g/rev • Dynamic engine speed < 200 RPM • And • Case 1: • MAF 0.05 – 0.75 g/rev • Engine speed 576 – 4,512 RPM • Or • Case 2: • Catalyst efficiency diagnosis active	• 72.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Lambda set value 1.00 [-] • And • O2S signal front > 0.89 [-]	• Fuel cut off not active • Engine running • And • Choice of: • Fuel trim diagnosis failure detected • Or • O2S rear sensor plausibility failure detected • And • Choice of: • Lambda adaptation value >= 0.12 [-] • Or • Lambda adaptation value <= -0.12 [-]	• 0.0 s • Continuous		
P219C Cylinder 1 Air-Fuel Ratio Imbalance	Air Fuel Imbalance Out Of Range Low	• Cylinder 1 • Adaption value unweighted < -13.0% • Cylinder 2 • Adaption value unweighted < -13.0% • Cylinder 3 • Adaption value unweighted < -13.0% • Cylinder 4 • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure n.a • Mass fuel flow set point 12.00 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Check-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1 • Adaption value weighted < -10.0% • Cylinder 2 • Adaption value weighted < -10.0% • Cylinder 3 • Adaption value weighted < -10.0% • Cylinder 4 • Adaption value weighted < -10.0%	• For segments 90.0 [-] • Segments after start n.a. • Time after engine start n.a. • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-]			ing”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Additional conditions • Misfire on currently lean shifted cylinder not detected			
P219D Cylinder 2 Air-Fuel Ratio Imbalance	Air Fuel Imbalance Out Of Range Low	• Cylinder 1 • Adaption value unweighted < -13.0% • Cylinder 2 • Adaption value unweighted < -13.0% • Cylinder 3 • Adaption value unweighted < -13.0% • Cylinder 4 • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure n.a • Mass fuel flow set point 12.00 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start n.a. • Time after engine start n.a. • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1 • Adaption value weighted < -10.0% • Cylinder 2 • Adaption value weighted < -10.0% • Cylinder 3 • Adaption value weighted < -10.0% • Cylinder 4 • Adaption value weighted < -10.0%	• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219E Cylinder 3 Air-Fuel Ratio Imbalance	Air Fuel Imbalance Out Of Range Low	• Cylinder 1 • Adaption value unweighted < -13.0% • Cylinder 2 • Adaption value unweighted < -13.0% • Cylinder 3 • Adaption value unweighted < -13.0% • Cylinder 4 • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure n.a • Mass fuel flow set point 12.00 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start n.a. • Time after engine start n.a. • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1 • Adaption value weighted < -10.0% • Cylinder 2 • Adaption value weighted < -10.0% • Cylinder 3 • Adaption value weighted < -10.0% • Cylinder 4 • Adaption value weighted < -10.0%	• 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219F Cylinder 4 Air-Fuel Ratio Imbalance	Air Fuel Imbalance Out Of Range Low	• Cylinder 1 • Adaption value unweighted < -13.0% • Cylinder 2 • Adaption value unweighted < -13.0% • Cylinder 3 • Adaption value unweighted < -13.0% • Cylinder 4 • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure n.a • Mass fuel flow set point 12.00 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start n.a. • Time after engine start n.a. • Integrated mass air flow >= 0.75 to 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1 • Adaption value weighted < -10.0% • Cylinder 2 • Adaption value weighted < -10.0% • Cylinder 3 • Adaption value weighted < -10.0% • Cylinder 4 • Adaption value weighted < -10.0%	• 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2231 O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 1	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 1	• Delta O2S signal front > 190 uA	• Engine speed < 2,700 RPM • Engine load < 60% • Heater duty cycle 20 – 80% • Modeled exhaust gas temp < 800.1° C • Lambda 0.95 – 1.05 [-] • Heater control closed loop no fault	• 15.0 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Voltage (VIP)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • And • Choice of: • Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 0.0115 A • Or • Measurement WRAF sensor label resistor > n.a. Ohm	• O2S front (linear) ready • Measurement of WRAF sensor label resistor finished • Pump current controller active	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (VN)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) <= 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.20 V • And • Choice of: • Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 0.0115 A • Or • Measurement WRAF sensor label resistor > n.a. Ohm	• O2S front (linear) ready • Measurement of WRAF sensor label resistor finished • Pump current controller active	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Ground (VG)	• Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 0.0115 A • Or • Measurement WRAF sensor label resistor > n.a. Ohm • And • Choice of: • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) <= 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • Or	• O2S front (linear) ready • Measurement of WRAF sensor label resistor finished • Pump current controller active	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.20 V				
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection Pump Relay Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .
P2258 AIR System Control "A" Circuit High	Secondary Air Injection Pump Relay Short To Battery Plus	• Actuator temperature > 155 to 185° C • Or • Output current (hardware values) > 1.0 – 2.0 A	• Engine running • Actuator commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2261 Turbocharger/Supercharger Bypass Valve "A" - Mechanical	Turbocharger Deceleration Bypass Valve Functional Check: Stuck Close	• Case 1: • Integrated boost pressure > n.a. kPa*s • Or • Integrated boost pressure < n.a. kPa*s • Case 2: • Counter for boost pressure deviation > 5.00 [-]	• External torque request not demanded • IAT @ throttle > -11° C • Barometric pressure > 73.0 kPa • Intake overpressure protection not active • Active turbocharger protection leading to opening of the waste gate not active • Activations conditions: • Recirculation actuator position set point 100.0% • Time since last valve closed activation > 1,200 ms • Gradient accelerator pedal value <= -97.70%/s • Max boost pressure variation <= 50.0 kPa	• 0.1 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ "3.6.34 Turbocharger Recirculation Valve N249 , Checking", page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .
P2263 Turbocharger/Supercharger Boost System Performance	Turbocharger Boost Control Position Sensor Functional Check	• No adaption of boost pressure actuator sensor in actual driving cycle (no previous adaptation occurred)		• 0.0 s • Once / DCY	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ "3.6.34 Turbocharger Recirculation Valve N249 , Checking", page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear Signal Range Check	• Case 1: • Max. O2S rear voltage < 0.87 V • And • Oxygen load during Peak Max detection > 2.6 g • Or • Case 2: • O2S front ready max. O2S rear voltage < 0.87 V • And • Oxygen load during Peak Max detection > 2.5 g • And • Counter in case of suspected Peak Max error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 sec. • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 – 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Temperature conditions • ECT > 60° C • IAT > -48° C	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0% • Dynamic MAF < 25.01 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear Signal Range Check	• Case 1: • Max. O2S rear voltage > 0.25 V • And • Oxygen load during Peak Max detection > 2.6 g • Or • Case 2: • O2S front ready max. O2S rear voltage > 0.25 V • And • Oxygen load during Peak Max detection > 2.5 g • And • Counter in case of suspected Peak Max error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • Barometric pressure n.a. • Catalyst overheating protection not active • O2S rear ready • O2S front ready • O2S front pump current valid • O2S heater rear active • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Or • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Lambda controller deviation < 0.08 to 0.15 [-] • Quickpass trim control ready • Proportional part of trim control < 0.25 [-] • Lambda adaption commanded off • Scavenging not active • Valve lift not active • Time after a catalyst purge phase >= 0.02 s • Temperature conditions • ECT > 60° C • IAT > -48° C	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Modeled catalyst temp. 500 – 700° C • Modeled catalyst temp. extended range 470 – 730° C • Integrated MAF catalyst temp. conditions fulfilled > n.a. g • Difference between dynamic and stationary catalyst temp. -254.0 – 254.0 K • Difference between dynamic and stationary catalyst temp. extended range -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled exhaust gas temperature at O2S rear <= 1,201° C • Air mass flow conditions • MAF per cylinder 40.0 – 130.0 kg/h • MAF per cylinder extended range 35.0 – 135.0 kg/h • MAF 125.01 – 580.0 mg/rev • MAF set point 125.0 – 580.0 mg/rev • MAF extended range n.a. mg/rev • Limited dynamics conditions • Dynamic engine speed < 20 RPM • Dynamic lambda controller output <= 20.0% • Dynamic MAF < 25.01 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Integrated MAF after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions • Canister load <= 2.0 [-] • Or • Evap purge valve closed • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 • Integrated MAF to start diagnosis n.a. • O2S front dynamic diagnosis separate not active			
P2274 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	• Sensor voltage of <= 0.70 V • O2S rear signal not oscillating at reference < 0.62 – 0.65 V • Enrichment after stuck lean 27.9%	• Mass air flow 25 – 150 kg/h • O2S rear readiness > 30.0 s • Modeled exhaust gas temp > 350° C • 2nd lambda control closed loop	• 215.0 s	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	• O2S sensor voltage >= 0.15 V • After oxygen mass flow (fuel cutoff) > 4,500 mg • Number of checks >= 1	• Time of fuel cutoff <= 90.0 s • Time after last fuel cutoff >= 20 Sec. • O2S rear ready • Exhaust temp at sensor >= 385° C • Exhaust mass flow > 12 kg/h • Exhaust mass flow dynamic within range -80 – 80 kg/h • Sensor voltage at start of measurement > 0.45 V	• 10.0 s	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P2279 Intake Air System Leak	Intake Air System Rationality Check	• Ratio adapted turbocharger boost pressure and actual turbocharger boost pressure > 30.0% • Lambda correction included controller and adaption -50.0 – 50.0% • Lambda controller active	• Intake manifold modeled adaption active (by turbocharger boost pressure) • Throttle position > 4.50° TPS • Engine speed 1,216 – 6,000 RPM • Pressure quotient @ throttle 0.63 – 0.90 [-] • Engine running • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/sec. • Fuel cut off not active • Time after engine start > 5.0 s • Boost pressure < 135.0 kPa • BARO 73.0 – 107.5 kPa	• 5.0 s • Continuous	• 2 DCY	– Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Throttle Valve Con-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle cross-sectional area correction included controller and adaptation > 50.0% • Lambda correction included controller and adaptation -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/sec. • Fuel cut off not active • Time after engine start > 5.0 s • Boost pressure 73.0 – 107.5 kPa • BARO 73.0 – 107.5 kPa			trol Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
P2293 Fuel Pressure Regulator 2 Performance	Fuel Pressure Regulator 2 Performance	• Difference between target pressure vs actual pressure: > 1.50 MPa • Or • < -1.50 MPa	• Time after engine start 10.0 s • Fuel cutoff not active	• 3.0 s	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P2294 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel Pressure Regulator 1 Control Circuit/ Open	• Signal voltage 1.40 – 3.20 V • Or • Signal pattern incorrect	• Fuel control valve commanded off • Fuel pump commanded on	• 0.5 s	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2295 Fuel Pressure Regulator 2 Control Circuit Low	Fuel Pressure Regulator 2 Control Circuit Low	• Signal voltage 1.40 – 3.20 V	• Fuel control valve commanded off	• 0.5 s	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P2296 Fuel Pressure Regulator 2 Control Circuit High	Fuel Pressure Regulator 2 Control Circuit High	• Signal voltage > 3.20 V	• Fuel control valve commanded on	• 0.5 s	• 2 DCY	– Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in ON state > 50.0 – 100.0 mA (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Output temperature from ATIC in ON state > 160.0 – 200.0° C • Or • Output current in ON state > 100.0 – 180.0 mA (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2302 Ignition Coil "A" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in OFF state lower range >= 1.92 – 2.21 V • Output voltage in OFF state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in ON state > 50.0 – 100.0 mA (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Output temperature from ATIC in ON state > 160.0 – 200.0° C • Or • Output current in ON state > 100.0 – 180.0 mA (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2305 Ignition Coil "B" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in OFF state lower range >= 1.92 – 2.21 V • Output voltage in OFF state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in ON state > 50.0 – 100.0 mA (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Output temperature from ATIC in ON state > 160.0 – 200.0° C • Or • Output current in ON state > 100.0 – 180.0 mA (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2308 Ignition Coil "C" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in OFF state lower range >= 1.92 – 2.21 V • Output voltage in OFF state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in ON state > 50.0 – 10.0 mA (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Air Fuel Imbalance Rationality Check	• Cylinder misfire counter > 10.00 [-]		• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Air Fuel Imbalance Rationality Check	• Cylinder misfire counter > 10.00 [-]		• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7, Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Air Fuel Imbalance Rationality Check	• Cylinder misfire counter > 10.00 [-]		• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Air Fuel Imbalance Rationality Check	• Cylinder misfire counter > 10.00 [-]		• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Output temperature from ATIC in ON state > 160.0 – 200.0° C • Or • Output current in ON state > 100.0 v 180.0 mA (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2311 Ignition Coil "D" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in OFF state lower range >= 1.92 – 2.21 V • Output voltage in OFF state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Leak Detection Pump Open Circuit	• Output voltage 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Leak Detection Pump Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2402 EVAP System Leak Detection Pump Control Circuit High	Leak Detection Pump Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current > 1.0 – 3.0 A (hardware values)	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	EVAP System Leak Detection Pump Sense Circuit/Open	• Low signal voltage > 0.5 s	• Time after engine start 5.0 – 65,530 • ECT 5 – 120° C • ECT at start 5 – 50° C • Engine off time > 21,600 • Altitude < 2,700 m • Integrated purge flow > 12 g • Restart temp diff > 0 K • Veh speed >= 0 km/h • Veh speed ones > 30 km/h • Any drive gear • EVAP purge valve ready no faults • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2404 EVAP System Leak Detection Pump Sense Circuit Range/Performance	EVAP System Leak Detection Pump Sense Circuit Range/Performance	• High signal voltage > 12 sec. • Number of checks = 30	• Time after engine start 12 – 65,530 • Engine off time > 21,600 • ECT 5 – 120° C • ECT at start 5 – 50° C • Ambient air temp 5 – 59° C • Altitude < 2,700 m • Intake manifold vacuum > -2,560 hPa • Restart temp diff > 0° K • Veh speed >= 0 km/h • Veh speed ones > 30 km/h • Any drive gear • EVAP purge valve ready no faults • LDP commanded off	• 12.0 – 143.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/Erratic	EVAP System Signal Check	• Pump current oscillation > 1.5 mA • And • Number of aborted leak measurements due to pump current oscillations > 0.00 [-]	• Time after measurement start > 4.0 s (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P240A EVAP System Leak Detection Pump Heater Control Circuit/ Open	EVAP Leak Detection Pump Heater Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range 2.75 – 3.36 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	EVAP Leak Detection Pump Heater Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240C EVAP System Leak Detection Pump Heater Control Circuit High	EVAP Leak Detection Pump Heater Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current > 1.0 – 3.0 A (hardware values)	• Actuator commanded on	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Rationality Check	• Pump current correction > 1.2 mA (nernst-cell)	• O2S front ready • Fuel cut off not active • Cylinder shut off not active • Combustion mode change not active • Depending on engine state: • Engine part load • Or • Engine full load • Or • Engine idle for time >= 3.0 s	• 10.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air System Pressure Sensor Rationality Check	• Difference between AIR pressure and barometric pressure > 6.00 kPa • And • Difference between AIR pressure and intake manifold pressure > 6.00 kPa	• Engine stop • For time n.a.	• 0.1 s • Multiple	• 2 DCY	– Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Secondary Air System Pressure Sensor Out Of Range Low	• Sensor voltage < 0.50 V		• 0.1 s • Continuous	• 2 DCY	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Secondary Air System Pressure Sensor Out Of Range High	• Sensor voltage > 4.50 V		• 0.1 s • Continuous	• 2 DCY	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Valve Functional Check	• Ratio relative pressure phase 1 and relative pressure phase 2 > 1.50 [-]	• General: • Secondary air pump ready • Catalyst heating active • Secondary air injection active • MAF 140.00 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • And • Diff. barometric pressure vs. manifold pressure > n.a. [kPa • Or • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .
P2450 EVAP System Switching Valve Performance/ Stuck Open	EVAP System Rationality Check	• Time after measurement start > 2.0; < 2.5 s • And • Drop of evap pump current < 3.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start <= 20.3 K • Engine stop (during ECM keep alive-time) • Airbag not activated	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2563 Turbocharger Boost Control Position Sensor "A" Circuit Range/Performance	Turbocharger Boost Control Position Sensor Functional Check	• Boost pressure actuator sensor voltage > 4.52; < 2.73 V	• Gradient of boost pressure >= -2.98 %/s	• 0.3 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2564 Turbocharger Boost Control Position Sensor "A" Circuit Low	Turbocharger Boost Control Position Sensor Short To Ground / Open Circuit	• Turbocharger boost control position sensor voltage < 0.20 V		• 0.1 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2565 Turbocharger Boost Control Position Sensor "A" Circuit High	Turbocharger Boost Control Position Sensor Short To Battery Plus	• Turbocharger boost control position sensor voltage > 4.80 V		• 0.1 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2610 ECM/ PCM Engine Off Timer Performance	Engine Off Time Rationality Check	• Difference between engine-off time and ECM keep alive-time > 12.0 s • Or • Engine off time not valid (hardware values)	• General: • SPI communication finished • ECM internal time valid • Choice of: • ECM keep alive time active • ECM internal timer reset not activated • Time delay >= 1.0 s • Or • Delay timer for acquisition of engine off time > 1.0 sec. (hardware values) • Or • Result of low power check initialization > 0.0; < 9.0 [-]	• 0.01 s • Once / DCY	• 2 DCY	– Check power and ground inputs to ECM first. Refer to appropriate wiring schematic for pin locations. If all powers/ grounds to ECM are present, replace the Engine Control Module - J623- . Refer to appropriate repair manual. v468
		• Difference between engine-off time and ECM keep alive-time >= 12.0 s	• Time after engine stop < 86,400.0 s • Engine off time plausible • Engine off time monitoring not finished • Engine off time signal valid • Time after reset < 2.0 s • And • Case 1: engine off timer n.a. • Or • Engine off time n.a. • Case 2: • ECM internal timer active • SPI communication failure after reset detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Off Time ECM Internal Timer Check	• ECM internal timer initialization failure • Or • ECM internal timer communication failure	• ECM internal timer reset not active • SPI communication failure after reset not detected	• 1.3 s • Continuous		
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	• O2S signal front > 4.81 V	• Modeled exhaust temp < 700° C • O2S ceramic temp > 715° C • Fuel cut off active • Heater control closed loop • No low fuel signal	• 1.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3081 Engine Temperature Too Low	Engine Temperature Too Low	• Cooling system temperature < 74° C – 84° C after AAT check		• 4.0 s	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the After-Run Coolant Pump - V51- . Refer to ⇒ “3.6.2 After-Run Coolant Pump V51 , Checking”, page 851 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P334A Charge Pressure Actuator Electrical Error	Turbocharger Boost Pressure Control Valve Short Circuit	• Bypass valve driver current > 9.3 – 15.0 A (hardware values)	• Boost pressure actuator controller active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465-. Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 – Check the Turbocharger Recirculation Valve -N249-. Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain BUS Reading Back Sent Message Powertrain	• Message no feedback	• Time after ignition on 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
U0002 High Speed CAN Communication Bus Performance	CAN: Global Time Out CAN Communication	• General CAN timeout >= 0.4 s	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0101 Lost Communication with TCM	CAN: Transmission Control Module (TCM) CAN Communication With TCM	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module and the Engine Control Module - J623- . Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 859 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	CAN: Brake System Control Module (BSCM) CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0140 Lost Communication With Body Control Module	CAN: Body Control Module (BCM) CAN Communication With Body Control Module	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0302 Software Incompatibility With Transmission Control Module	ECM: Coding Code Check Of ECM Concerning TCM	• Received AT vehicle data from TCM signal		• 50.0 s • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0323 Software Incompatibility With Instrument Panel Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature sensor: Source configuration failure	• Time after ignition on > 1.2 s	• 1.0 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0402 Invalid Data Received From TCM	CAN: Transmission Control Module (TCM) CAN Communication With TCM	• Received data from TCS implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: sensor error 327.42 km/h • Speed sensor signal: initialization error 327.08 km/h • Speed sensor signal: low voltage error 327.25 km/h • Speed sensor signal: range error 326.40 – 327.07 km/h • Or • Speed sensor signal: range error 327.09 – 327.24 km/h • Or • Speed sensor signal: range error 327.26 – 327.41 km/h • Or • Speed sensor signal: range error 327.43 – 327.67 km/h	• Time after ignition on > 500.0 ms	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
	CAN: Brake System Control Module (BSCM) CAN Communication With Brake Unit	• Received data from TCS implausible message	• Time after ignition on >= 0.5 s			
	Vehicle Speed Rationality Check High	• Vehicle speed > 325 km/h		• 2.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0422 Invalid Data Received From Body Control Module	Invalid Data Received From Body Control Module	• Ambient temperature value initialization failure	• Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 2.0 s	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received data from instrument cluster implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285- . Refer to appropriate repair manual.
	CAN: Ambient Air Temperature Sensor CAN Communication With Ambient Air Temperature Sensor	• Ambient air temperature signal failure	• Time after ignition on > 0.5 s	• 0.6 s • Continuous		
	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature sensor: Source in reset failure	• Time after ignition on > 1.2 s • Engine running	• 2.0 s • Continuous		
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data from Gateway implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U1103 Production Mode Active	ECM: Production Mode Function Monitoring: Mode Change	• Production mode active	• Vehicle speed < 5 km/h • Max trip mileage since initial vehicle start-up < 100 km • During ECM keep alive-time after ignition off • Engine speed 0 RPM • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY	– Vehicle is in production mode. Refer to appropriate repair manual for resolution. Note the mode can be deactivated with a factory scan tool or will automatically turn off after vehicle accumulates the first 100 km (62.14 miles) of driving.

3.4.3 Engine Control Module , 2016 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator Rationality Check	• Adjustment angle difference >= 3.0; < 15.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Set point change > 29.0° CRK • Camshaft position n.a. • Dynamic diagnosis timer >= 0.95 – 4.0 s	• 0 (FTP75: 300.0) s • Continuous	• 2 DCY (NAR)	– Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	• Output voltage lower range 1.92 – 2.21 V • Output voltage upper range 2.85 – 3.25 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator Rationality Check	• Camshaft position deviation > 10.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position n.a. • Camshaft position adjustment active • Catalyst heating not active • Camshaft position deviation integrator (actual vs. set point position) >= 9.0 – 12.0° CRK*s	• 0 (FTP75: 250.0) s • Continuous	• 2 DCY (NAR)	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position / Crankshaft Position (CMP/CKP) Intake Sensor Adaptation Value Monitoring	• Adapted value for each edge of the target wheel < -14.0° CRK • Adapted value for each edge of the target wheel > 14.0° CRK	• Camshaft position adaptation (exhaust side) active • Engine speed 288 – 4,000 RPM • Modeled oil temperature >= -15° C • Modeled oil temperature <= 160° C • Diff. actual exhaust camshaft position vs. previous camshaft position @ reference signal edge < 2.0° CRK • Case 1: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • Case 2: • Engine speed >= 380 RPM • Engine running • Engine stalling >= 5.0 s • Case 3: • Backwards rotation not detected • Case 4: • Engine speed >= 400 RPM • Engine stopped	• 720.0° CRK • Multiple	• 2 DCY (NAR)	– Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	• O2S front heater voltage lower range 1.92 – 2.21 V • O2S front heater voltage upper range 2.85 – 3.25 V		• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	• O2S front heater voltage < 1.92 – 2.21 V		• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	• O2S front heater driver temperature > 160.0 – 200.0° C • Or • O2S front heater driver output current driver stage internal value	• Modeled EGT @ O2S front not calibrated ° C • Actuator commanded on	• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0033 Turbocharger/Supercharger Bypass Valve "A" Control Circuit	Turbocharger Bypass (TCBY) Open Circuit	• Voltage lower range 1.92 – 2.21 V • Voltage upper range 2.85 – 3.25 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger Bypass (TCBY) Short To Battery Plus	• Current driver stage internal value • Temperature > 160 – 200° C (hardware values)	• Actuator commanded on			to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0034 Turbocharger/Supercharger Bypass Valve "A" Control Circuit Low	Turbocharger Bypass (TCBY) Short To Ground	• Voltage < 1.92 – 2.21 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous .	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	• O2S rear heater voltage lower range 1.92 – 2.21 V • O2S rear heater voltage upper range 2.85 – 3.25 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	• O2S rear heater voltage < 1.92 – 2.21 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	• O2S rear heater driver temperature > 160.0 – 200.0° C • O2S rear heater driver output current driver stage internal value	• Modeled EGT @ O2S rear >= 300° C • O2S heater commanded on	• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0045 Turbocharger/Supercharger Boost Control "A" Circuit/Open	Turbocharger (TC) Boost Pressure Control Open Circuit	• Bypass valve driver load resistance > 200 kΩ	• Deviation between actual and filtered boost pressure actuator position <= 5.0% • Boost pressure control not active • Time delay > 1.0 s	• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0049 Turbocharger/Supercharger "A" Turbine Overspeed	Turbocharger (TC) Boost Pressure Control Out Of Range High	• Turbocharger speed >= 240,002 RPM • IAT @ throttle >= 336° C • For time >= 6.0 s	• Engine running	• 2.6 s • Continuous	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0068 MAP/ MAF - Throttle Position Correlation	Manifold Absolute Pressure (MAP) Sensor Large Leakage Detection	• Diff. MAP set point vs. actual MAP < -15.0 – -10.0 kPa	• Fast throttle adaptation finished • MAP gradient -200.00 – 200.00 kPa/s • Vehicle speed <= 2 km/h • Time after engine start > 5.0 s • Engine speed lower range > 576 RPM • Engine speed upper range < 3,000 RPM • IAT @ manifold > -48° C • ECT @ cylinder block > -48° C • Pressure quotient @ throttle 0.10 – 0.60 [-] • Load dynamic conditions: • Dynamic engine speed < 8,160 RPM • Dynamic air mass < 25.01 mg/rev	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air (IA) System Rationality Check	• Throttle opening area correction included controller and adaption < -60.0% • Lambda correction included controller and adaption -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Turbocharger boost pressure 135.0 kPa • BARO 73.0 – 107.50 kPa			
P0070 Ambient Air Temperature Sensor Circuit "A"	COM: Ambient Air Temperature (AAT) Sensor Short To Battery / Open Circuit	• AAT sensor voltage (hardware values) > 4.50 V		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Outside Air Temperature Sensor -G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Ambient Air Temperature (AAT) Sensor Cross Check	• Diff. AAT vs. IAT @ first engine start > 20 K (depending on engine off time) • Diff. AAT vs. ROT @ first engine start > 20 K (depending on engine off time) • Diff. IAT vs. ROT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure a cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. AAT vs. min. AAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0072 Ambient Air Temperature Sensor Circuit "A" Low	COM: Ambient Air Temperature (AAT) Sensor Short To Ground	• AAT sensor voltage < 0.10 V (hardware values)		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0087 Fuel Rail/ System Pressure - Too Low Bank 1	Fuel Rail Pressure (FRP) Out Of Range Low	• Deviation between reference fuel pressure set point and current fuel pressure > 2,000.10 kPa • Case 1: • Deviation lambda of controller included adaptation -50.0 – 50.0% • High pressure controller output > 30 mg • Fuel pressure < 2,500.0 kPa • Case 2: • Fuel pump at max limit • Mass fuel flow set point not calibrated mg/rev • Fuel pressure not calibrated kPa	• General: • Engine speed > 608 – 6,816 RPM • Fuel mass set point 15.01 – 1,389.0 mg/rev • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not active • Full load not calibrated • Catalyst purge not calibrated • Lambda control not calibrated • Evap purge functionality diagnosis not calibrated • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/rev • Fuel mass set point gradient -1,389.0 – 2.20 mg/rev • For time >= 1.2 s • Depending on canister purge: • Canister load not calibrated [-] • Evap purge valve not calibrated	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
	Fuel Rail Pressure (FRP) Rationality Check Low	• Deviation lambda of controller included adaptation -50.0 – 50.0% • High pressure controller output > 35 mg • Deviation between fuel pressure set point and current fuel pressure > 2,000.10 kPa • Fuel pressure < 2,500.0 kPa		• 5.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0088 Fuel Rail/ System Pressure - Too High Bank 1	Fuel Rail Pressure (FRP) Out Of Range High	• Deviation between fuel pressure set point and current fuel pressure < -2,000.10 kPa • Deviation lambda of controller included adaption -50.0 – 50.0% • Case 1: • High pressure controller output < -30 mg • Case 2: • Flow control valve open • Mass fuel flow set point > 15.01 mg/rev	• General: • Engine speed 608 – 6,816 RPM • Fuel mass set point 15.01 – 1,389.0 mg/rev • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not active • Full load not calibrated • Catalyst purge not calibrated • Lambda control not calibrated • Evap purge functionality diagnosis not calibrated • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/rev • Fuel mass set point gradient -1,389.0 – 2.20 mg/rev • For time >= 1.2 s • Depending on canister purge: • Canister load not calibrated [-] • Evap purge valve not calibrated [-]	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/ or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0090 Fuel Pressure Regulator 1 Control	Fuel Volume Regulator Control Open Circuit	• Voltage high side < 1.87 – 2.26 V • Voltage low side > 2.78 – 3.33 V	• Engine speed 0 RPM • Fuel cut off active • Actuator commanded off	• 0.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
Circuit/ Open		• Low and high side off: • Voltage low side > 2.78 – 3.33 V • Voltage high side < 1.87 – 2.26 V • Low and high side on: • Current low side driver stage internal value • Current high side driver stage internal value	• Engine speed > 600 RPM • Fuel cut off not active • Actuator commanded on			Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0091 Fuel Pressure Regulator 1 Control Circuit Low	Fuel Volume Regulator Control Short To Ground (High Side)	• Current high side driver stage internal value (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded on	• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
	Fuel Volume Regulator Control Short To Ground (Low Side)	• Voltage low side < 1.87 – 2.26 V (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded off			
P0092 Fuel Pressure Regulator 1 Control Circuit High	Fuel Control Valve Short To Battery Plus (Low Side)	• Current low side driver stage internal value (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded on	• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Control Valve Short To Battery Plus (High Side)	• Voltage high side < 2.78 – 3.33 V (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded off •			Testing", page 873 . – Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .
P00AF Turbocharger/Supercharger Boost Control "A" Module Performance	Turbocharger (TC) Boost Pressure Control Functional Check - Transient Check	• Boost pressure actuator position controller output > 98.0%	• Time after engine start >= 4.0 s • ECT > -40° C • AAT > -40° C • Catalyst heating not active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .
		• Boost pressure actuator position controller output < -98.0%				
	Turbocharger (TC) Boost Pressure Control Functional Check	• Deviation boost pressure actuator position controller > 12.0 – 100.0%	• Time after engine start >= 4.0 s • ECT > -40° C • AAT > -40° C • Boost pressure control active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/Performance	Manifold Absolute Pressure (MAP) Sensor Engine Standing: Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Case 2: non charged engine • Diff. BARO mean value vs. MAP mean value n.a. kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time n.a. kPa	• Case A: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case B: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. BARO mean value vs. MAP mean value n.a. kPa				
	Manifold Absolute Pressure (MAP) Sensor ECM Keep Alive-Time: Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Case 2: Non charged engine • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time > n.a. kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Intake Air (IA) System Rationality Check	• Throttle opening area correction included controller and adaption > 40.0% • Lambda correction included controller and adaption < -28.0%	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active	• 5.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle opening area correction included controller and adaption < 40.0% • Lambda correction included controller and adaption > 28.0%	• Time after engine start > 5.0 s • Turbocharger boost pressure < 135.0 kPa • BARO 73.0 – 107.50 kPa			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Absolute Pressure (MAP) Sensor Short To Ground	• Intake manifold pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery Plus	• Intake manifold pressure sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .
P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor Cross Check	• Diff. IAT vs. AAT @ first engine start > 20 K (depending on engine off time) • And • Diff. IAT vs. ROT @ first engine start > 20 K (depending on engine off time) • And • Diff. AAT vs. ROT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure a cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. AAT vs. min. AAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor Short To Ground	• IAT sensor voltage < 0.10 V		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature (IAT) Sensor Open Circuit	• IAT sensor voltage > 4.50 V		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor No Change On Signal	• Diff. max. ECT vs. min. ECT < 1.5 K	• ECT range conditions: • ECT @ start < 82; > 98° C • ECT @ start not calibrated ° C • Driving condition H: • Engine part load • Engine full load • Engine speed > 1,300 RPM • Vehicle speed >= 50 km/h • Ratio air mass flow to max. air mass flow > 6.0% • Time after conditions are fulfilled > 30.0 – 60.0 s • Driving condition L: • Engine idle • Vehicle speed not calibrated km/h • Or • Fuel cut off active • Time after conditions are fulfilled > 30.0 – 60.0 s	• 120.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check Low	• Difference between modelled and measured cylinder block temperature > 10° C	• ECT @ cylinder block -128 – 127° C • Time after engine start > 60.0 s	• 10.0 s • Continuous		
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check Inappropriately Low	• Diff. min temperature of cross check sensors vs. ECT @ cylinder block @ engine start >= 10° C	• Cross checks finished	• 1.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check High	• ECT @ cylinder block @ engine start > 40 – 80° C	• Engine off time >= 240.0 m	• 3.0 s • Once / DCY		
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	• ECT sensor voltage < 0.30 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	• ECT sensor voltage > 4.90 V	• IAT at throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P0121 Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	Throttle Position Sensor (TPS) 1 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 1 >= 1.0 [-] • Relative mass air flow integral from TPS 1 > 60.0 [-]	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active	• 0.01 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
		• Difference between TPS 1 and TPS 2 > 6.499° TPS		• 0.3 s • Continuous		
P0122 Throttle/Pedal Position Sensor/Switch "A" Circuit Low	Throttle Position Sensor (TPS) 1 Short To Ground	• Throttle position sensor 1 voltage < 0.17 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor (TPS) 1 Short To Battery Plus	• Throttle position sensor 1 voltage > 4.83 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Short To Ground	• O2S sensor voltage < 0.15 V	• Engine running	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Short To Battery Plus	• O2S sensor voltage > 5.20 – 5.35 V	• Engine running	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Dynamic Path Response Check	• Average check • Mean value of normalised signal amplitude >= 1.0 [-] • Ratio check • Ratio of failed diagnostic cycle n.a. [-]	• Conditions range 1: (standard parameters) • General conditions: • Time after engine start not calibrated s • ECT >= -48° C • Vehicle speed not calibrated km/h • Integrated air mass after gear change not calibrated kg • MAF 0.0 – 1,389.0 mg/rev • Integrated air mass per cylinder not calibrated kg • Static conditions: • O2S front ready • Lambda stimulation active • Lambda control value -35.0 – 35.0% • Engine speed 928 – 3,008 RPM • MAF to activate diagnosis function 150.0 – 600.0 mg/rev • MAF per segment > 18.0 kg/h • Normalized integrated fuel mass in oil < 255.0 [-] • Catalyst purge not active • Limited dynamic conditions: • Integrated air mass after dynamic conditions are fulfilled not calibrated g • Dynamic engine speed < 150 RPM	• 4.4 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF not calibrated mg/rev • Dynamic MAF per segment < 30.0 kg/h • Dynamic lambda not calibrated % • Change of dynamic torque < 0.07 [-] • Conditions range 2: (Diagnosis carried out together with the catalyst efficiency diagnosis) • General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0%			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-] • Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temperature conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated % • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Case 1: • Evap purge valve not calibrated • Case 2: • Canister load calculation not calibrated • Evap purge valve not calibrated • Case 3: • Canister load not calibrated • Evap purge valve not calibrated • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass to start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Front Delay Path Response Check	• Normalised lambda controller value vs. modeled lambda value >= 1.0 [-]	• General conditions • O2S front ready • Time after engine start not calibrated s • MAF to activate diagnosis function not calibrated mg/rev • Integrated air mass per cylinder >= 0.42 – 2.0 kg • Vehicle speed not calibrated km/h • Static condition • Engine speed 1,056 – 3,008 RPM • MAF per cylinder 15.0 – 150.0 kg/h • Vehicle speed not calibrated km/h • Dynamic conditions • Dynamic engine speed < 288 RPM • Dynamic torque < 80.0 Nm • Absolute dynamic MAF < 70.0 kg/h • Activation due to canister purge • Canister purge no purge • Canister purge not active • Canister purge wait ramp open • Canister purge min purge • Canister load known • Canister purge n.a.			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Moving mean value canister load <= 1.80 [-]			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Functional Check	• O2S ceramic temp. < 730° C	• O2S heater commanded on • For time >= 10.0 s	• 20.0 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Short To Ground	• O2S sensor voltage < 0.15 V	• O2S heater active	• 0.6 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Short To Battery	• O2S sensor voltage > 5.2 – 5.35 V	• O2S heater active	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Rich To Lean Transition Response Check	• Gradient sensor voltage < 1,000.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Lean To Rich Transition Response Check	• Gradient sensor voltage < 650.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Rich To Lean Transition Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Lean To Rich Transition Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Open Circuit	• Internal resistance of O2S (binary) > 65,534.0 Ω		• 2.5 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range High	• Internal resistance of O2S (binary) 700.0 – 65,534.0 Ω	• O2S heater commanded on • For time >= 10.0 s	• 20.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0149 Fuel Timing Error	Fuel Injection Valves Out Of Range Low	• Boost voltage < 30.0 V	• Engine running >= 0.3 s	• 3.6 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
		• Boost voltage <= 50.0 V				
	Fuel Injection Valves Out Of Range High	• Boost voltage > 75.0 V				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	• Lambda controller output > 35.0%	• Lambda control closed loop • Air mass > 60.00 mg/rev • Engine speed > 576 RPM • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value	• 60.0 s • Continuous	• 2 DCY (NAR)	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	• Lambda controller output < -35.0%	• Lambda control closed loop • Air mass > 60.00 mg/rev • Engine speed > 576 RPM • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Oil dilution not detected • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value	• 60.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Mod-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						ule J538 , Testing”, page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
P0190 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel Pressure (LP) Sensor Short To Battery / Open Circuit	• High fuel pressure sensor voltage > 4.80 V		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	Fuel Rail Pressure (FRP) Out Of Range High	• Fuel pressure > 27,900.09 kPa	• Engine running • Engine speed < 8,160 RPM • Time after engine start > 5.0 s	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	Fuel Pressure (LP) Sensor Short To Ground	• High fuel pressure sensor voltage < 0.20 V		• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0 CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0 CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0 CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/Performance	Throttle Position Sensor (TPS) 2 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 2 >= 1.0 [-] • Relative mass air flow integral from TPS 2 > 60.0 [-]	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active	• 0.01 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 Short To Ground	• Throttle position sensor 2 voltage < 0.17 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 Short To Battery Plus	• Throttle position sensor 2 voltage > 4.83 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0234 Turbocharger/Supercharger "A" Overboost Condition	Turbocharger (TC) Boost Pressure Control Out Of Range High	• Boost pressure > calculated max. plausible value • Boost pressure deviation < 209.90 – 265.0 kPa • Turbocharger protection active	• Engine running • Accelerator pedal value > 0.0% • Fuel cut off n.a. • Difference between boost pressure and barometric pressure >= 20.0 kPa	• 1.3 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0236 Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance	Turbocharger (TC) Boost Pressure Sensor Engine Standing: Cross Check	• Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Diff. BARO vs. MAP <= 7.50 kPa	• Case 1: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case 2: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger (TC) Boost Pressure Sensor ECM Keep Alive-Time: Cross Check		• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
P0237 Turbocharger/Supercharger Boost Sensor "A" Circuit Low	Turbocharger (TC) Boost Pressure Sensor Short To Ground	• Turbocharger boost pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0238 Turbocharger/Supercharger Boost Sensor "A" Circuit High	Turbocharger (TC) Boost Pressure Sensor Short To Battery Plus	• Turbocharger boost pressure sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P025A Fuel Pump Module "A" Control Circuit/Open	Fuel Pump (FP) Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • Signal voltage upper range (hardware values) < 2.84 – 3.25 V	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P025C Fuel Pump Module "A" Control Circuit Low	Fuel Pump (FP) Short To Ground	• Signal voltage < 1.92 – 2.21 V (hardware values)	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P025D Fuel Pump Module "A" Control Circuit High	Fuel Pump (FP) Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C • Signal current (hardware values) driver stage internal value	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded on	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0261 Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0262 Cylinder 1 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0264 Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0265 Cylinder 2 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current driver stage internal value (hardware values)	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current driver stage internal value (hardware values)				
P0299 Turbocharger/Supercharger "A" Underboost Condition	Turbocharger (TC) Boost Pressure Control Out Of Range Low	• Boost pressure < calculated min. plausible value • Boost pressure deviation > 5.0 kPa	• Engine running • Turbo charger bypass valve closed • For time >= 1.0 s • Pressure ratio before charger set point > 1.30 [-] • For time >= 1.2 – 1.9 s • Engine speed > 2,208 – 2,750 RPM • Barometric pressure > 73.0 kPa • ECT > -10° C • No cylinder is shut off • Fuel tank level not calibrated %	• 4.0 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Manifold Adaptive Value Check	• Turbo charger actuator set point >= 17.0 – 20.0%	• Engine running • Conditions: • For time >= 0.5 s • Difference between filtered boost pressure and basic boost pressure > 40.01 kPa • Difference between filtered boost pressure set point and basic boost pressure > 40.01 kPa • Boost pressure control deviation < 20.0 kPa • Boost pressure set point < 16.0 kPa • Actual boost pressure < 30.0 kPa • Difference between current boost pressure set point and basic boost pressure > 3.0 kPa • ECT > -20° C • IAT @ throttle > 0° C • Engine speed 2,500 – 6,800 RPM • Conditions: • For time >= 5,000.0 ms • Difference between actual turbocharger speed and maximum turbocharger speed set point > 9,003 RPM • Conditions: • For time >= 1,000.0 ms • No gear shift • Fuel cut off not active	• 0.01 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Multiple)	• Number of cylinders with emission threshold misfire within 4,000 revolutions >= 2.0 [-] • Or • Number of cylinders with emission threshold misfire within 1,000 revolutions >= 2.0 [-]	• Emission threshold misfire detected	• 1,000 rev • Continuous	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Number of cylinders with catalyst damaging misfire >= 2.0 [-]	• Catalyst damaging misfire detected	• 200 rev • Continuous	• Immediately (NAR)	with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25%	• Time after engine start not calibrated s • Engine load > 6.59 – 43.0% • depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40%	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25%	• Time after engine start not calibrated s • Engine load > 6.59 – 43.0% • depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40%	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25%	• Time after engine start not calibrated s • Engine load > 6.59 – 43.0% • depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40%	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 5.56 – 62.50%	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25%	• Time after engine start not calibrated s • Engine load > 6.59 – 43.0% • depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40%	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0326 Knock /Combustion Vibration Sensor 1 Circuit Range/Performance Bank 1 or Single Sensor	Knock Sensor (KS) Rationality Check Low	• Difference between knock sensor signal and average knock sensor signal < 0.0 – 0.12 V	• ECT @ cylinder block > 60° C • Air mass > 229.0 mg/rev	• 4.3 s • Continuous	• 2 DCY (NAR)	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0327 Knock /Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor (KS) Out Of Range	• Sensor signal < 0.12 – 0.31 V	• ECT @ cylinder block > 60° C • Air mass > 229.0 mg/rev • Engine speed > 2,016 RPM	• 4.0 s • Continuous	• 2 DCY (NAR)	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0335 Crank shaft Position Sensor "A" Circuit	Crankshaft Position (CKP) Sensor Activity Check	• Case 1: • Counted exhaust camshaft signals without synchronization >= n.a. [-] • Counted intake camshaft signals without synchronization n.a. [-] • Case 2: • Counted exhaust camshaft signals without synchronization >= 1.0 [-] • Counted intake camshaft signals without synchronization >= 17.0 [-]	• Signal edges @ selected camshaft signal detected • Choice of: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • Synchronization test incorrect • Engine speed >= 380 RPM • Engine running • Engine stalling >= 5.0 s • Backwards rotation not detected • Engine speed >= 400 RPM • Engine stop active	• 0.01 s • Continuous	• 2 DCY (NAR)	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Crankshaft Position (CKP) Sensor CPDD - Crankshaft Position Out Of Range	• Pulse width backwards < 62; > 150 µs • For number of pulse widths outside tolerance > 1.0 [-] • Pulse width forwards < 15; > 62 µs • For number of pulse widths outside tolerance > 1.0 [-]	• Engine speed > 32; < 1,200 RPM	• 1,800.0° CRK • Continuous		
P0336 Crank shaft Position Sensor "A" Circuit Range/Performance	Crankshaft Position (CKP) Sensor Loss Of Synchronization Rationality Check	• Crankshaft synchronization lost	• Engine running	• 2,160.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor -

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position (CKP) Sensor Tooth Number Rationality Check	• One or two additional teeth recognized incorrect • Or • One or two teeth missed	• Engine speed > 320 RPM	• 1,800.0° CRK • Continuous		G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Crankshaft Position (CKP) Sensor Tooth Period Rationality Check	• Sensor signal < 50 – 156 µs • Engine speed > 1,200 RPM • Sensor signal < 30 µs • Engine speed <= 1,200 RPM	• Engine running	• 45,720.0° CRK • Continuous		
	Crankshaft Position Sensor Segment Monitoring Out Of Range	• Segment adaptation >= 7.0%	• Fuel cut off all cylinders active • Segments in fuel cut-off mode >= 32.0 [-]	• 180.0° CRK • Continuous		
P0340 Camshaft Position Sensor "A" Circuit Bank 1 or Single Sensor	Camshaft Position (CMP) Intake Sensor Signal Activity Check	• Signal change not detected • For number of reference gap >= 3.00 [-]	• Engine speed > 32 RPM	• 2,520.0° CRK • Continuous	• 2 DCY (NAR)	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869
P0341 Camshaft Position Sensor "A" Circuit Range/Per-	Camshaft Position (CMP) Intake Sensor Rationality Check	• Segment period ratio factor < 0.36; > 2.75 [-] • Offset between camshaft and crankshaft < -79.0; > 15.0° CRK	• Engine speed > 32; < 8,160 RPM	• 952.5° CRK • Continuous	• 2 DCY (NAR)	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
formance Bank 1 or Single Sensor	Camshaft Position (CMP) Intake Sensor Angular Offset Check	• Offset between camshaft and crankshaft < -79.0; > 15.0° CRK	• Engine speed > 32 RPM	• 450.0° CRK • Once / DCY		Checking", page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869
	Camshaft Position (CMP) Intake Sensor Signal Activity Check	• Segment time value < 50 µs	• Engine speed > 32; < 8,160 RPM	• 1,440.0° CRK • Continuous		
P039B Cylinder 1 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY (NAR)	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ "3.6.21

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Knock Sensor 1 G61 , Checking", page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ "3.6.11 Engine Speed Sensor G28 , Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03A5 Cylinder 2 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY (NAR)	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03AF Cylinder 3 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY (NAR)	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03B9 Cylinder 4 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY (NAR)	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/rev • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Secondary Air Injection (AIR) Functional Check	• Diff. pressure value after secondary air injection vs. pressure value before secondary air activation > 5.0 kPa	• General: • AIR pump ready • Catalyst heating active • AIR finished • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • Diff. BARO vs. MAP n.a. kPa • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY (NAR)	– Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 . – Check the Secondary Air Injection Solenoid Valve -N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0413 AIR System Switching Valve "A" Circuit Open	Secondary Air Injection (AIR) Valve Open Circuit	• Output voltage (hardware values) 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Secondary Air Injection (AIR) Valve Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
	Secondary Air Injection (AIR) Valve Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) driver stage internal value	• Engine running • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	• Output voltage, lower range 1.92 – 2.21 V • Output voltage, upper range (hardware values) <= 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System NMOG / NMHC / NOX Conversion Capability	• Arithmetic average • Catalyst efficiency not calibrated [-] • EWMA filtered • Catalyst efficiency not calibrated [-] • Arithmetic average, corrected with measured delay and transition time of oxygen sensors rear • Catalyst efficiency > 1.0]-] • EWMA filtered, corrected with measured delay and transition time of oxygen sensors rear • Catalyst efficiency not calibrated [-]	• General conditions: • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear ready • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.32 Three Way Catalytic Converter, TWC Checking”, page 914 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temperature conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled catalyst temperature @ start > 550° C • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated • Close the gap conditions:			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active • For arithmetic average value calculation: • Number of checks required for valid result >= 2.0 [-] • For EWMA-filter: • Minimum number of tests per DCY required not calibrated • Step change detection will initiate multiple tests per DCY • Conditions for step change detection: • Relative deviation between new measured value and old EWMA filtered value not calibrated [-] • Number of checks not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P043E EVAP System Leak Detection Reference Orifice Low Flow	Evaporative Emission (EVAP) System Out Of Range High	• Evap pump current during reference measurement > 40.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P043F EVAP System Leak Detection Reference Orifice High Flow	Evaporative Emission (EVAP) System Out Of Range Low	• Evap pump current during reference measurement < 15.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) Canister Purge Valve Functional Check: Stuck Close	• Ratio actual intake manifold pressure and modeled set point intake manifold pressure < 0.05 [-]	• ECT @ cylinder block > 58° C • BARO > 73.0 kPa • AAT > 5° C • AAT @ start >= 5° C • Diff. BARO vs. filtered MAP >= 25.0 kPa • Diff. BARO vs. filtered MAP > 25.0 – 40.0 kPa • Engine speed < 2,800 RPM • ratio MAF @ manifold and MAF max > 0.07...0.09 [-] • Engine speed < 1,180 RPM • Coasting function not calibrated • Vehicle speed >= 5 km/h • Diff. engine speed vs. filtered engine speed < 90 RPM • Diff. ratio MAF @ manifold and MAF max vs. ratio filtered MAF @ manifold and MAF max < 0.15 [-] • Diff. modeled MAP vs. filtered modeled MAP < 1.50 kPa • Integrated air mass since engine start >= 0.0 – 5,000.0 g • lambda conditions fulfilled • Lambda control active • Lambda control value -30.0 – 30.0% • O2S front 0.95 – 1.05 [-]	• 8.5 s • Once / DCY	• 2 DCY (NAR)	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Fuel cut off not calibrated • Case 1: • Integrated air mass @ canister purge valve per driving cycle not calibrated g • Case 2: • Ratio MAF @ canister purge and MAF per cylinder not calibrated [-] • canister purge sampling rate >= 40.0% • integrated air mass @ canister purge valve >= 2.1 g • Depending on AAT: • AAT >= 20° C • Canister load <= 0.09 [-] • Or • AAT >= 20; < 30° C • Canister load <= 0.09 [-] • AAT < 30° C • Canister load <= 0.32 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Rationality Check	• Difference pump current vs. rough leak reference current < 0.0 mA • And • For time >= 600.0 s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the EVAP System for Leaks. Refer to ⇒ "2.2.4 EVAP System, Checking for Leaks", page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) > 3.13; <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0445 EVAP System Purge Control Valve "A" Circuit Shorted	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	• Output voltage (hardware values) 1.92 – 2.21 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	• Actuator temperature 160 – 200° C • Output current (hardware values) driver stage internal value	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) >= 3.13% • Actuator commanded on			
P0447 EVAP System Vent Control Circuit Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range (hardware values) 2.75 – 3.36 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
P0448 EVAP System Vent Control Circuit Shorted	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .
	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current (hardware values) driver stage internal value	• Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Rationality Check	• Difference pump current vs. small leak reference current < 0.0 mA • And • Pump current measurement time > 600.0 s • And • Pump current gradient >= 0.30; <= 0.01 mA/s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Evap purge adaptation < 0.30 [-] • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the EVAP System for leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
		• Pump current gradient < 0.002 mA/s				
		• Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient < 0.002 mA/s • And • Ratio between actual pump current and small leak reference pump current < 1.10 [-]				
		• Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient >= 0.30; <= 0.01 mA/s				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Functional Check	• Case 1: • Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.51 [-] • Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.51 [-] • Case 2: • Diff. expected integrated secondary air pressure pulsations and actual integrated secondary air pressure pulsations n.a. kPa/s • Case 3: • Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.03 [-] • Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.03 [-]	• General: • AIR pump active • Catalyst heating active • AIR active • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • Diff. BARO vs. MAP n.a. kPa • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY (NAR)	– Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0501 Vehicle Speed Sensor "A" Circuit Range/Performance	COM: Vehicle Speed Sensor (VSS) Communication With VSS	• Speed sensor fault value: out of range high failure • Speed sensor fault value: out of range low failure • Speed sensor fault value: rationality check high failure • Speed sensor fault value: rationality check low failure		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the vehicle speed signal. Refer to ⇒ “3.6.35 Vehicle Speed Signal, Checking”, page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
P0502 Vehicle Speed Sensor "A" Circuit Low	Vehicle Speed Sensor (VSS) Short To Ground Vehicle Speed Sensor (VSS) Open Circuit Vehicle Speed Sensor (VSS) Short To Battery Plus	• Diagnostic signal from output driver failure		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the vehicle speed signal. Refer to ⇒ “3.6.35 Vehicle Speed Signal, Checking”, page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • Engine load < 30.47% • (M/T only) • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0507 Idle Control System RPM - Higher Than Expected	Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • Set point change < n.a. RPM • For time n.a. s • And • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 200 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • For time n.a. • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • Engine load < 30.47% • (M/T only) • For time not calibrated s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Ignition Control (IC) Ignition Timing Monitor @ Idle	• Difference between commanded ignition timing efficiency vs. actual value > 20.0%	• Catalyst heating @ idle active • Commanded ignition timing efficiency during catalyst heating <= 80.0% • Fuel-fed overrun active • Engine idle • Pressure ratio @ throttle <= 1.0 [-] • Delta mass air flow set point not calibrated mg/rev • Delta engine speed not calibrated RPM • Vehicle speed 0 km/h	• 6.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Rationality Check	• Camshaft position deviation > 9.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position n.a. • Camshaft position adjustment active • Catalyst heating active • Camshaft position deviation integrator (actual vs. setpoint position) >= 9.0° CRK*s	• 0.0 (FTP75: 45.0) s • Once / DCY	• 2 DCY NAR)	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 853 .
P053F Cold Start Fuel Pressure Performance Bank 2	Cold Start Monitoring Fuel System Out Of Range Low	• Deviation between set point and actual fuel pressure > 1,500.2 kPa • For time >= 3.0 s	• General: • Engine speed > 608 RPM • Time after engine start > 3.0 s • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s	• 5.0 s • Once / DCY	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Fuel System Out Of Range High	• Deviation between set point and actual fuel pressure < -1,500.2 kPa • For time >= 3.0 s	• Fuel mass set point upper range <= 100.32 – 172.41 mg/rev • Fuel mass set point gradient -1,389.0 – 2.2 mg/rev • For time >= 1.2 s • Additional for catalyst heating: • Catalyst heating active • ECT @ cylinder block > -48° C • Fuel mass set point lower range >= 5.0 mg/rev • For time >= 3.0 s			– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P056E Cold Start Turbocharger/Supercharger Boost Control "A" Performance	Turbocharger (TC) Boost Pressure Control Valve Cold Start Functional Check - Slow Response	• Boost pressure actuator position controller output > 98.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Catalyst heating active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 . – Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .
		• Boost pressure actuator position controller output < -98.0%				
	Turbocharger (TC) Boost Pressure Control Valve Cold Start Functional Check	• Deviation boost pressure actuator position controller > 12.0 – 100.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Difference between actuator position set point in normal mode and during catalyst heating > 0.0% • Catalyst heating active • Boost pressure control active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P05A0 Active Grille Air Shutter "A" Stuck On	Active Grille Air Shutter Functional Check	• Blocked active grille air shutter detected	• AAT n.a.° C	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
		• Uncontrolled adjustment detected				
P05A2 Active Grille Air Shutter "A" Control Circuit/ Open	Active Grille Air Shutter Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • Signal voltage upper range < 2.85 – 3.25 V		• 0.5 s	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05A3 Active Grille Air Shutter "A" Control Circuit Range/Performance	Active Grille Air Shutter Functional Check	• Internal logic failure detected		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
		• initialization failure detected		• 0.0 s • Continuous		
	Active Grille Air Shutter Activity Check	• Active grille air shutter controller feedback signal failed		• 24.0 s • Continuous		
P05A4 Active Grille Air Shutter "A" Control Circuit High	Active Grille Air Shutter Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C • Or • Signal current driver stage internal value		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P05A5 Active Grille Air Shutter "A" Control Circuit Low	Active Grille Air Shutter Short To Ground	• Signal voltage < 1.92 – 2.21 V	• Recording time of signal voltage > 3.3 s • Active grille air shutter feedback failure not detected	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P05C0 Active Grille Air Shutter Module "A" Over Temperature	Active Grille Air Shutter Functional Check	• Internal overvoltage detected • Internal overtemperature detected		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P0601 Engine Internal Control Module Memory Check sum Error	Engine Control Module (ECM): Checksum Verification	• Calibration checksum incorrect		• 1.0 s • Continuous	• 2 DCY (NAR)	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		• Software checksum incorrect				
P0603 Engine Internal Control Module Keep Alive Memory (KAM) Error	Engine Control Module (ECM): Communication Check	• Device 1: • SPI communication with ATIC failure		• 2.0 s • Continuous	• 2 DCY (NAR)	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		• Device 2: • SPI communication with ATIC failure				
		• SPI communication with ATIC failure			• 1 DCY (NAR)	
	Engine Control Module (ECM): Fuel Injection Valves Internal Hardware Check	• Hardware vs. software version check during initialization failure		• 4.9 s • Once / DCY	• 2 DCY (NAR)	
		• Calibration during initialization failure				
		• Hardware during initialization failure				
		• Time reference from microcontroller during initialization missing		• 4,320.0° CRK • Continuous		
		• Communication between microcontrol-		• 4,320.0° CRK		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		ler and SDI-Driver power-stage failure		• Continuous		
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Engine Standing: Cross Check	• Case 1: charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Case 2: non charged engine • Diff. BARO mean value vs. MAP mean value n.a. kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa	• Case A: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case B: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY (NAR)	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor ECM Keep Alive-Time: Cross Check	• Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Barometric Pressure Sensor Out Of Range Low	• Measured barometric pressure < 45.0 kPa		• 5.0 s • Continuous		
	Barometric Pressure Sensor Out OF Range High	• Measured barometric pressure > 115.0 kPa				
	Knock Control Internal Hardware Check	• Knock control malfunction: signal acquisition error	• Engine running	• 6.4 s • Continuous		
	Engine Control Module (ECM): EEPROM Check	• EEPROM information failure		• 1.0 s • Continuous		
		• Decryption of NVMCrypt failed		• 1.0 s • Once / DCY		
		• Finished NVMCrypt integrity error				
		• Communication between sample software and production hardware error				
	Engine Control Module (ECM): RAM Internal Hardware Check	• RAM error detected	• Microcontroller failure • Reset counter > 1.0 [-]	• 0.04 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	ECM: Random Access Memory (RAM) Functional Check			• 0.01 s • Continuous		
	Engine Control Module (ECM): Analog / Digital Converter Function Monitoring: A/D Converter	• Diff. A/D-channel 1 vs. A/D channel 2 > 0.30 V		• 0.5 s • Continuous		
	Engine Control Module (ECM): Communication Check	• SPI communication with ATIC failed	• Time after ignition on >= 1.0 s	• 10.0 s • Continuous		
		• SPI communication with ATIC implausible				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	• Monitoring of difference between actual and set point torque value • Engine torque overflow > 45.0 – 350.0 Nm	• Throttle actuator commanded on	• 0.5 s • Continuous		
		• Monitoring of torque difference integration • Integrated engine torque > 550.0 Nm		• 0.01 s • Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Limitation	• Engine speed > 1,760 RPM	• Engine speed limitation active • Injection active	• 0.5 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	• Internal check failed		• 0.5 s • Continuous		
P0607 Control Module Performance	Barometric Pressure (BARO) Sensor Short To Ground	• Barometric pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Barometric Pressure (BARO) Sensor Short To Battery Plus	• Barometric pressure sensor voltage > 4.80 V				
P0634 Control Module Internal Temperature "A" Too High	Turbocharger (TC) Boost Pressure Control Over Temperature	• Bypass valve driver temperature (hardware values) > 170 – 190° C	• Control valve commanded on	• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Adaptation Value Monitoring	• Battery voltage <= 9.04 V	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) active	• 0.01 s • Once per lifetime	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Adaptation Value Monitoring (Start Check)	• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V • Difference between actual throttle and reference position > 0.503° TPS	• Throttle start check active • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 120° C	• 0.01 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Adaptation Value Monitoring (Top Limit)	• Difference between actual throttle and reference position > 0.503° TPS • Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V	• Throttle adaption active • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 120° C			
	Throttle Actuator Adaptation Value Monitoring (Bottom Limit)	• Difference between actual throttle and reference position > 0.503° TPS • Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.07 V				
	Throttle Actuator Adaptation Value Monitoring (Mechanical Stop Low)	• TPS 1 voltage < 0.40; > 0.80 V • TPS 2 voltage < 4.20; > 4.60 V				
	Throttle Actuator Adaptation Value Monitoring (Limp Home Position)	• Difference between actual TPS 1 or 2 voltage and voltage reference position > 0.25 V				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator Adaptation Value Monitoring	• Accelerator pedal value > 99.9% • Engine speed > 64 RPM • Vehicle speed > 2 km/h • IAT @ throttle < 5° C • ECT @ cylinder block < 5° C • ECT @ cylinder block > 120° C	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) active	• 0.01 s • Once per lifetime		
P0642 Sensor Reference Voltage "A" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 1 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0643 Sensor Reference Voltage "A" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 1 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0652 Sensor Reference Voltage "B" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 2 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0653 Sensor Reference Voltage "B" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 2 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0657 Actuator Supply Voltage "A" Circuit/ Open	Engine Components Supply Voltage Relay Open Circuit	• Output voltage lower range >= 1.90 – 2.30 V • Output voltage upper range (hardware values) <= 2.80 – 3.20 V	• Relay commanded off	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0658 Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	• Output voltage (hardware values) < 1.90 – 2.30 V	• Relay commanded off	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0659 Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	• Output current driver stage internal value • Actuator temperature (hardware values) > 175 – 195° C	• Relay commanded on	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0686 ECM/ PCM Power Relay Control Circuit Low	Main Relay Rationality Check During Engine Off	• Sensed circuit voltage > 6.0 V	• Main relay commanded off • For time >= 0.3 s	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
	Main Relay Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Relay commanded off • For time > 40.0 ms	• 0.2 s • Continuous		
P0687 ECM/ PCM Power Relay Control Circuit High	Main Relay Rationality Check During Engine Running	• Sensed circuit voltage < 5.0 V	• Main relay commanded on • For time >= 0.1 s	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
	Main Relay Short To Battery Plus	• Main relay driver temperature > 175 – 195° C • Or • Main relay output current (hardware values) driver stage internal value	• Main relay commanded on • For time >= 0.4 s	• 0.2 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0698 Sensor Reference Voltage "C" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 3 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0699 Sensor Reference Voltage "C" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 3 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A1 Fuel Rail Pressure Sensor Inappropriately Low	Fuel Rail Pressure (FRP) Sensor Rationality Check Low	• Deviation lambda of controller included adaption < -45.0% • High pressure controller output > 8 mg	• General: • Engine speed > 608 – 1,088 RPM • Fuel mass set point 1.99 – 20.01 mg/rev • Time after change to DFI not equipped s • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated. • Lambda control closed loop • Evap purge functionality diagnosis not active • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/rev • Fuel mass set point gradient -1,389.0 – 2.20 mg/rev • For time >= 1.2 s • Depending on canister purge: • Canister load <= 0.7 [-] • Evap purge valve not active or closed	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A2 Fuel Rail Pressure Sensor Inappropriately High	Fuel Rail Pressure (FRP) Sensor Rationality Check High	• Deviation lambda of controller included adaptation > 30.0% • High pressure controller output < -10 mg	• General: • Engine speed > 608 – 1,088 RPM • Fuel mass set point 4.01 – 29.99 mg/rev • Time after change to DFI not equipped s • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated • Lambda control closed loop • Evap purge functionality diagnosis not active • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/rev • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/rev • Fuel mass set point gradient -1,389.0 – 2.20 mg/rev • For time >= 1.2 s • Depending on canister purge: • Canister load <= 0.7 [-] • Evap purge valve not active or closed	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13EA Cold Start Ignition Timing Performance Off Idle	Ignition Control (IC) Ignition Timing Monitor @ Part Load	• Difference between commanded ignition timing efficiency vs. actual value > 12.0%	• Catalyst heating @ part load active • Commanded ignition timing efficiency during catalyst heating <= 88.0% • Engine part load • Delta mass air flow set point not calibrated mg/rev • Delta engine speed not calibrated RPM • Vehicle speed > 2 km/h	• 5.0 s • Once / DCY	• 2 DCY (NAR)	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1545 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Out Of Range	• Control duty cycle > 98.0%	• Throttle position not at min. value • Throttle adaptation not active • Throttle actuator commanded on	• 0.7 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Rationality Check	• Difference between throttle position set point and throttle flap opening angle for electronic throttle control > 2.998 – 24.982° TPS	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active • Throttle actuator commanded on • Diff. throttle position set point vs. throttle flap opening angle <= 1.999; > -1.999° TPS	• 0.5 s • Continuous		
P1609 Crash Shut-Off Was Triggered	Airbag Safety Measures Due To Crash With Airbag Activation	• Airbag(s) activated		• 0.0 s • Continuous	• 2 DCY (NAR)	– After proper repair of damage, erase the Engine Control Module - J623- DTC. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P169A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	• Transport mode active	• Vehicle speed < 5 km/h • Max trip mileage since initial vehicle start-up < 100.0 km • During ECM keep alive-time after ignition off • Engine speed 0 RPM • Production mode not active • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY (NAR)	– Vehicle is in Transport Mode (Loading Mode). It can be turned off with a scan tool or will automatically switch off after approximately 100 km (62.15 miles) have accumulated on the vehicle. May need to perform readiness check. Refer to ⇒ “3.2 Readiness Code”, page 14 .
P2004 Intake Manifold Runner Control Stuck Open Bank 1	Intake Manifold Runner Control (IMRC) Actuator Stuck Open	• Signal voltage > 1.89 V • For time >= 1.5 s	• Flap commanded off • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2006 Intake Manifold Runner Control Stuck Closed Bank 1	Intake Manifold Runner Control (IMRC) Actuator Stuck Close	• Signal voltage < 3.10 V • For time >= 1.5 s	• Flap commanded on • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2008 Intake Manifold Runner Control Circuit/ Open Bank 1	Intake Manifold Runner Control (IMRC) Actuator Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2009 Intake Manifold Runner Control Circuit Low Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Ground	• Output voltage (hardware values < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2010 Intake Manifold Runner Control Circuit High Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Battery Plus	• Power stage temperature > 160 – 200° C • Or • Output current (hardware values) driver stage internal values	• Engine running • Actuator commanded on	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2014 Intake Manifold Runner Position Sensor/Switch Circuit Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Ground / Open Circuit	• Intake manifold runner flap position sensor voltage < 0.20 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2017 Intake Manifold Runner Position Sensor/Switch Circuit High Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Battery Plus	• Intake manifold runner flap position sensor voltage > 4.80 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY (NAR)	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	• Output voltage (hardware values) < 1.92 – 2.21 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	• Power stage temperature > 160 – 200° C • Output current (hardware values) driver stage internal value	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	• Adaption value < -0.05 [-]	• 2nd lambda control n.a. • Catalyst purge not active • Injection mode change (DFI/MFI) not active • Engine speed >= 704 RPM • Counter of integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	• Adaption value > 0.05 [-]	• 2nd lambda control n.a. • Catalyst purge not active • Injection mode change (DFI/MFI) not active • Engine speed >= 704 RPM • Counter of integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2100 Throttle Actuator "A" Control Motor Circuit/ Open	Throttle Actuator Open Circuit	• Electronic throttle valve driver load resistance > 200.0 kΩ	• Difference between measured and filtered throttle position <= 119.50° TPS • Throttle actuator commanded off	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Over Temperature	• Electronic throttle valve driver temperature (hardware values) > 170.0 – 190.0° C	• Throttle actuator commanded on	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2103 Throttle Actuator "A" Control Motor Circuit High	Throttle Actuator Short Circuit	• Electronic throttle valve driver current (hardware values) driver stage internal value	• Throttle actuator commanded on	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	• Signal voltage sensor 1 < 0.39 V		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	• Signal voltage sensor 1 > 4.86 V		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	• Signal voltage sensor 2 < 0.19 V		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	• Signal voltage sensor 2 > 2.80 V		• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 and 2 Rationality Check	• Difference between signal voltage sensor 1 and sensor 2 > 0.10 – 0.12 V		• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Direct Fuel Injection System Too Lean @ Part Load	• Adaptive value >= 28.0%	• Air mass > 60.0 mg/rev • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Fuel mass 17.99 – 51.02 mg/rev • Engine speed 1,280 – 4,000 RPM • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/rev • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Dependence on canister purge min:	• 5.0 s • Continuous •	• 2 DCY (NAR)	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value			Testing”, page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Direct Fuel Injection System Too Rich @ Part Load	• Adaptive value <= -25.0%	• Air mass > 60.0 mg/rev • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Fuel mass 17.99 – 51.02 mg/rev • Engine speed 1,280 – 4,000 RPM • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/rev • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Dependence on canister purge min:	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value			GX9 , Checking", page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Cooling System Performance Not In The Expected Range	• Cooling system temperature too low < 61 – 76° C	• Modeled ECT > 66 – 76° C • ECT @ first start > -10° C • ECT @ first start < 47 – 57° C • Min. AAT > -10° C • At time of fault decision: • Ratio fuel cut off <= 10.2% • Ratio maximum vehicle speed <= 14.8% • For vehicle speed > 120 km/h • Ratio start-stop time <= 16.0% • Ratio engine load time <= 39.8% • For air mass flow ratio with max air mass flow < 2.5% • For air mass flow ratio with max air mass flow > 40.0%	• 0.0 (Unified 430.0) s • Once / DCY	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the After-Run Coolant Pump - V51- . Refer to ⇒ “3.6.2 After-Run Coolant Pump V51 , Checking”, page 851 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2183 Engine Coolant Temperature Sensor 2 Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Cross Check	• Diff. ROT vs. IAT @ first engine start > 20 K (depending on engine off time) • Diff. ROT vs. AAT @ first engine start > 20 K (depending on engine off time) • Diff. AAT vs. IAT @ first engine start < 20 K (depending on engine off time)	• Engine off time > 360.0 m • Decrement check to ensure a cold vehicle state: • Diff. IAT vs. min. IAT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s • Diff. ROT vs. min. ROT @ condition < 4.5 K • Vehicle speed > 20 km/h • For time > 20.0 s	• 100.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Short To Ground	• Sensor voltage <= 0.30 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Short To Battery / Open Circuit	• Sensor voltage > 4.90 V	• IAT @ throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Direct Fuel Injection System Too Lean @ Idle	• Case 1: • Adaptive value >= 2.40 mg/rev • Case 2: • Adaptive value n.a. kg/h	• Air mass > 60.0 mg/rev • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/rev • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Fuel mass upper range < 0.0 – 17.0 mg/rev • Fuel mass lower range not calibrated mg/rev • Engine speed 704 – 992 RPM • Engine n.a. • Evap purge valve closed • Canister load <= 1.20 [-]	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ "3.6.16 Fuel Pressure Sensor G247 , Checking", page 879 . – Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value			– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Direct Fuel Injection System Too Rich @ Idle	• Case 1: • Adaptive value <= -2.40 mg/rev • Case 2: • Adaptive value n.a. kg/h	• Air mass > 60.0 mg/rev • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/rev • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Fuel mass upper range < 0.0 – 17.0 mg/rev • Fuel mass lower range not calibrated mg/rev • Engine speed 704 – 992 RPM • Engine n.a. • Evap purge valve closed • Canister load <= 1.20 [-]	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value			GX9 , Checking", page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check - Upstream And Downstream Oxygen Sensor Signal	• Lambda value > 1.15 [-] • O2S signal rear >= 0.88 V	• O2S front ready • O2S rear ready • ECT >= -48° C • Limited dynamic conditions active • Mass air flow > 15.0; < 300.0 kg/h • Catalyst purge not active • Engine speed > 1,152 RPM • Exhaust gas temperature at O2S rear > -273; < 800° C • Combustion mode change not active	• 72.0 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check - Upstream And Downstream Oxygen Sensor Signal	• Lambda value < 0.85 [-] • And • O2S rear voltage <= 0.25 V	• O2S front ready • O2S rear ready • ECT >= -48° C • Limited dynamic conditions active • Mass air flow > 15.0; < 300.0 kg/h • Catalyst purge not active • Engine speed > 1,152 RPM • Exhaust gas temperature at O2S rear > -273; < 800° C • Combustion mode not active	• 72.0 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • Adaption value unweighted < -13.0% • Cylinder 2: • Adaption value unweighted < -13.0% • Cylinder 3: • Adaption value unweighted < -13.0% • Cylinder 4: • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • Adaption value weighted < -10.0% • Cylinder 2: • Adaption value weighted < -10.0% • Cylinder 3: • Adaption value weighted < -10.0% • Cylinder 4: • Adaption value weighted < -10.0%	• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • Adaption value unweighted < -13.0% • Cylinder 2: • Adaption value unweighted < -13.0% • Cylinder 3: • Adaption value unweighted < -13.0% • Cylinder 4: • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • Adaption value weighted < -10.0% • Cylinder 2: • Adaption value weighted < -10.0% • Cylinder 3: • Adaption value weighted < -10.0% • Cylinder 4: • Adaption value weighted < -10.0%	• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • Adaption value unweighted < -13.0% • Cylinder 2: • Adaption value unweighted < -13.0% • Cylinder 3: • Adaption value unweighted < -13.0% • Cylinder 4: • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • Adaption value weighted < -10.0% • Cylinder 2: • Adaption value weighted < -10.0% • Cylinder 3: • Adaption value weighted < -10.0% • Cylinder 4: • Adaption value weighted < -10.0%	• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • Adaption value unweighted < -13.0% • Cylinder 2: • Adaption value unweighted < -13.0% • Cylinder 3: • Adaption value unweighted < -13.0% • Cylinder 4: • Adaption value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • Adaption value weighted < -10.0% • Cylinder 2: • Adaption value weighted < -10.0% • Cylinder 3: • Adaption value weighted < -10.0% • Cylinder 4: • Adaption value weighted < -10.0%	• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Voltage (VIP)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • Choice of: • Nernst voltage (VN) > 4.40 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Pump current driver stage internal value • Measurement O2S front label resistor n.a. Ω	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s	• 2.3 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (VN)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • Choice of: • Nernst voltage (VN) > 4.40 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Pump current driver stage internal value • Measurement O2S front label resistor n.a. Ω	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s	• 2.3 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Virtual Ground (VG)	• Nernst voltage (VN) > 4.40 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Pump current driver stage internal value • Measurement O2S front label resistor n.a. Ω • Choice of: • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) <= 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s driver stage internal value	• 2.3 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.20 V				
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	• Output voltage (hardware values) < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	• Actuator temperature > 160 – 200° C • Output current (hardware values) driver stage internal value	• Engine running • Actuator commanded on	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2261 Turbocharger/Supercharger Bypass Valve "A" - Mechanical	Turbocharger Bypass (TCBY) Functional Check: Stuck Close	• Case 1: • Integrated boost pressure deviation between PUT and filtered PUT n.a. kPa*s • Case 2: • Counter PUT crosses filtered PUT > 5.0 [-] • Operational sequence for incrementing counter in case 2: • Positive difference between PUT and filtered PUT > 0.80 kPa • After • Negative difference between PUT and filtered PUT (first count: only positive difference) < -2.0 kPa	• External torque request not demanded • IAT @ throttle > -11° C • Barometric pressure > 73.0 kPa • Intake overpressure protection not active • Active turbocharger protection leading to opening of the waste gate not active • Activations conditions: • Recirculation actuator position set point 100.0% • Time since last valve closed activation > 1,200 ms • Gradient accelerator pedal value <= -97.70%/s • Max boost pressure variation <= 50.0 kPa	• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P2263 Turbocharger/Supercharger Boost System Performance	Turbocharger (TC) Position Sensor First Adaption Monitoring: Functional Check	• No adaption of boost pressure actuator sensor in actual driving cycle (no previous adaption occurred)		• 0.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Range Check	• Case 1: • Max. O2S rear voltage < 0.87 V • Oxygen load during peak max detection > 4.0 g • Case 2: • Max. O2S rear voltage < 0.87 V • Oxygen load during peak max detection > 3.8 g • Counter in case of suspected Peak Max error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear ready • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S front <= 1,201° C • Air mass conditions • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/rev • Dynamic lambda controller output <= 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: Case 1 • Evap purge valve not calibrated • Case 2: • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3: • Canister load not calibrated [-] • Evap purge flow not calibrated • Close the gap conditions			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Range Check	• Case 1: • Min. O2S rear voltage > 0.25 V • Oxygen load during peak min detection > 2.6 g • Case 2: • Min. O2S rear voltage > 0.25 V • Oxygen load during peak min detection > 2.5 g • Counter in case of suspected peak min error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • Engine speed 1,280 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of trim control < 0.25 [-] • Coasting function not active	• 86.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda adaption not active • Valve lift not equipped • Temperature conditions • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT at O2S rear <= 1,201° C • Air mass conditions • Air mass @ start of diagnosis 125.01 – 580.0 mg/rev • Air mass during diagnosis not calibrated mg/rev			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/rev • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			
P2279 Intake Air System Leak	Intake Air (IA) System Rationality Check	• Ratio adapted turbocharger boost pressure and actual turbocharger boost pressure > 35.0% • Lambda correction included controller and adaption -50.0 – 50.0% • Lambda controller active	• Intake manifold modeled adaptation active (by turbocharger boost pressure) • Throttle position > 4.50° TPS • Engine speed 1,216 – 6,000 RPM • Pressure quotient @ throttle 0.63 – 0.90 [-] • Engine running • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Boost pressure < 135.0 kPa • BARO 73.0 – 107.5 kPa	• 5.0 s • Continuous	• 2 DCY (NAR)	– Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle opening area correction included controller and adaption > 50.0% • Lambda correction included controller and adaption -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Turbo charger boost pressure < 135.0 kPa • BARO 73.0 – 107.5 kPa			GX3 , Checking", page 915 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_inactive_low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diagnosis_by_machine low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2302 Ignition Coil "A" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_machine low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Diagnosis_by_machine low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2305 Ignition Coil "B" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_inactive_low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Diagnosis_by_inactive_low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2308 Ignition Coil "C" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/rev • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • Engine speed 1,248 – 2,816 RPM • Dependence on oxygen sensor diagnosis • Oxygen sensor dynamic diagnosis finished n.a.	• 4 times • Once / DCY	• 2 DCY (NAR)	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/rev • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_inactive high side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diagnosis_by_machine_low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2311 Ignition Coil "D" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY (NAR)	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 155 – 185° C • Output current driver stage internal value (hardware values)	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	Evaporative Emission (EVAP) System Signal Check	• Pump current oscillation > 1.5 mA • And • Number of aborted leak measurements due to pump current oscillations > 0.0 [-]	• Time after measurement start > 4.0 s (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240A EVAP System Leak Detection Pump Heater Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range 2.75 – 3.36 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240C EVAP System Leak Detection Pump Heater Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current driver stage internal value (hardware values)	• Actuator commanded on	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check	• Pump current correction > 1.2 mA (nernst-cell)	• O2S front ready • Fuel cut off not active • Cylinder shut off not active • Injection mode change not active • Depending on engine state: • Engine part load • Engine full load • Engine idle • For time >= 3.0 s	• 10.0 s • Continuous	• 2 DCY (NAR)	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	• Difference between AIR pressure and barometric pressure > 6.0 kPa • Difference between AIR pressure and intake manifold pressure > 6.0 kPa	• Engine stop • For time not calibrated s	• 0.1 s • Multiple	• 2 DCY (NAR)	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Out Of Range Low	• Sensor voltage < 0.50 V		• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Out Of Range High	• Sensor voltage > 4.50 V		• 0.1 s • Continuous	• 2 DCY (NAR)	– Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Valve Functional Check	• Ratio relative pressure phase 1 and relative pressure phase 2 > 1.50 [-]	• General: • AIR pump active • Catalyst heating active • AIR active • MAF 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • Diff. BARO vs. MAP n.a. kPa • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY (NAR)	– Check the Secondary Air Injection Solenoid Valve -N112- . Refer to ⇒ "3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking", page 909 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 .
P2450 EVAP System Switching Valve Performance/ Stuck Open	Evaporative Emission (EVAP) System Rationality Check	• Time after measurement start > 2.0; < 2.5 s • And • Drop of evap pump current < 3.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 0.5 s • Once / DCY	• 2 DCY (NAR)	– Check the Leak Detection Pump - V144- . Refer to ⇒ "3.6.22 Leak Detection Pump V144 , Checking", page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2563 Turbocharger Boost Control Position Sensor "A" Circuit Range/Performance	Turbocharger (TC) Position Sensor Adaptation Monitoring: Functional Check	• Boost pressure actuator sensor voltage > 4.52; < 2.73 V	• Gradient of boost pressure >= -2.98%/s	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2564 Turbocharger Boost Control Position Sensor "A" Circuit Low	Turbocharger (TC) Position Sensor Short To Ground / Open Circuit	• Turbocharger boost control position sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2565 Turbocharger Boost Control Position Sensor "A" Circuit High	Turbocharger (TC) Position Sensor Short To Battery Plus	• Turbocharger boost control position sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2610 ECM/ PCM Engine Off Timer Performance	Engine Off Time Rationality Check	• Difference between engine-off time and ECM keep alive-time > 12.0 s	• Monitor Entry Conditions: • ECM keep alive time active • Delay time >= 1.0 s • Last ECM activation time >= 2.0 s • Time after last engine stop < 48 h • Case 1: • For time (after entry conditions fulfilled) >= 65.0 s • Case 2: • For time (after entry conditions fulfilled) < 65.0 s • Ignition key transition off to on	• 10.0 ms • Once / DCY	• 2 DCY (NAR)	– Check power and ground inputs to ECM first. Refer to appropriate wiring schematic for pin locations. If all powers/ grounds to ECM are present, replace the Engine Control Module -J623- . Refer to appropriate repair manual.
		• Difference between engine-off time and ECM keep alive-time >= 12.0 s	• Time after engine stop < 86,400.0 s • Engine off time plausible • Engine off time monitoring not finished • Engine off time signal valid • Time after reset < 2.0 s • Case 1: • Engine off timer not calibrated • Engine off time not calibrated s • Case 2: • ECM internal timer active • SPI communication failure after reset detected	• 0.01 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Off Time ECM Internal Timer Check	• ECM internal timer failure • ECM internal timer signal not calibrated • ECM internal timer not calibrated • time after last engine stop not calibrated h	• SPI initialization finished	• 1.3 s • Continuous		
P3043 Fuel Pump Mechanical Malfunction	COM: Fuel Pump Control Module (FPCM) Communication With FPCM	• FP signal: ROM / RAM failure feedback >= 3.0 [-]	• Engine on	• 13.8 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P3044 Fuel Pump "A" Control Circuit Low	COM: Fuel Pump Control Module (FPCM) Communication With FPCM	• FP signal: overcurrent failure feedback >= 3.0 [-]	• Engine on	• 16.8 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P3045 Fuel Pump Electronics Faulty	COM: Fuel Pump Control Module (FPCM) Communication With FPCM	• FP signal: rotary failure feedback >= 3.00 [-]	• Engine on	• 19.8 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3073 Fuel Pump "A" Control Circuit/ Open	COM: Fuel Pump Control Module (FPCM) Communication With FPCM	• FP signal: power amplifier failure feedback >= 3.00 [-]	• Engine on	• 22.8 s • Continuous	• 2 DCY (NAR)	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P334A Charge Pressure Actuator Electrical Error	Turbocharger (TC) Boost Pressure Control Short Circuit	• Bypass valve driver current driver stage internal value (hardware values)	• Boost pressure control active	• 0.4 s • Continuous	• 2 DCY (NAR)	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 – Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain BUS Reading Back Sent Message Powertrain	• Message no feedback	• Time after ignition on 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Bus Communication Check	• Global timeout >= 0.4 s	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0101 Lost Communication with TCM	COM: Transmission Control Module (TCM) Communication With TCM	• Received message from TCM no message	• Time after ignition on 0.5 s	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance between the Transmission Control Module and the Engine Control Module - J623- . Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 859 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	• Received message no message	• Time after ignition on 0.5 s	• 2.0 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster IPC Communication With IPC	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0302 Software Incompatibility With Transmission Control Module	Engine Control Module (ECM): Coding Code Check Of ECM Concerning TCM	• Received AT vehicle data TCM signal		• 50.0 s • Continuous	• 2 DCY (NAR)	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0323 Software Incompatibility With Instrument Panel Control Module	COM: Ambient Air Temperature (AAT) Sensor Communication With IPC	• Ambient temperature sensor: Source configuration failure	• Time after ignition on > 1.2 s	• 1.0 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	• Received data from TCM implausible message	• Time after ignition on 0.5 s	• 0.3 s • Continuous	• 2 DCY (NAR)	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Vehicle Speed Sensor (VSS) Communication With VSS	• Speed sensor signal: sensor error 327.42 km/h	• Time after ignition on > 500.0 ms	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.5 CAN-Bus Terminal Resistance, Checking”, page 857 .
		• Speed sensor signal: initialization error 327.08 km/h				
		• Speed sensor signal: low voltage error 327.25 km/h				
		• Speed sensor signal: range error 326.40 – 327.07 km/h • Speed sensor signal: range error 327.09 – 327.24 km/h • Speed sensor signal: range error 327.26 – 327.41 km/h • Speed sensor signal: range error 327.43 – 327.67 km/h				
	COM: Brake System Control Module (BSCM) Communication With BSCM	• Received data from TCS implausible message	• Time after ignition on >= 0.5 s			
	Vehicle Speed Sensor (VSS) Rationality Check High	• Vehicle speed > 325 km/h		• 2.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster IPC Communication With IPC	• Received data from IPC implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285- . Refer to appropriate repair manual.
	COM: Ambient Air Temperature (AAT) Sensor Communication With AAT Sensor	• Ambient air temperature signal failure	• Time after ignition on > 0.5 s	• 0.6 s • Continuous		
	COM: Ambient Air Temperature (AAT) Sensor Communication With IPC	• Ambient temperature sensor: source in reset failure	• Time after ignition on > 1.2 s • Engine running	• 2.0 s • Continuous		
U0447 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	• Received data from gateway implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY (NAR)	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U1103 Production Mode Active	Engine Control Module (ECM): Production Mode Function Monitoring: Mode Change	• Production mode active	• Vehicle speed ≤ 5 km/h • Max trip mileage since initial vehicle start-up < 100 km • During ECM keep alive-time after ignition off • Engine speed 0 RPM • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY (NAR)	– Vehicle is in production mode. Refer to appropriate repair manual for resolution. Note the mode can be deactivated with a factory scan tool or will automatically turn off after vehicle accumulates the first 100 km (62.14 miles) of driving.

3.4.4 Engine Control Module , 2017 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	Variable Valve Timing (VVT) Intake Actuator slow response	• Adjustment angle difference >= 3.0; < 15.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Set point change > 29.0° CRK • Camshaft position not calibrated • Dynamic diagnosis timer >= 0.95 – 4.0 s	• 0 (FTP75: 300.0) s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator Control Circuit/ Open Bank 1	Variable Valve Timing (VVT) Intake Actuator Open Circuit	• Output voltage lower range 1.92 – 2.21 V • Output voltage upper range 2.85 – 3.25 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	Variable Valve Timing (VVT) Intake Actuator target error	• Camshaft position deviation > 10.0° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position n.a. • Camshaft position adjustment active • Catalyst heating not active • Camshaft position deviation integrator (actual vs. set point position) >= 9.0 – 12.0° CRK*s	• 0 (FTP75: 250.0) s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position / Crankshaft Position (CMP/CKP) Intake Sensor Adaptation Value Monitoring	• Adapted value for each edge of the target wheel < -14.0° CRK • Adapted value for each edge of the target wheel > 14.0° CRK	• Camshaft position adaptation (exhaust side) active • Engine speed 288 – 4,000 RPM • Modeled oil temperature >= -15° C • Modeled oil temperature <= 160° C • Diff. actual exhaust camshaft position vs. previous camshaft position @ reference signal edge < 2.0° CRK • Case 1: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • CKP stalling not detected • Case 2: • Engine speed >= 380 RPM • Or • Engine running • And • Engine stalling >= 5.0 s • CKP stalling not detected • Case 3: • Backwards rotation not detected • CKP stalling not detected • Case 4: • Engine speed >= 400 RPM • Engine stopped	• 720.0° CRK • Multiple	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 . – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Open Circuit	• O2S front heater voltage lower range 1.92 – 2.21 V • O2S front heater voltage upper range 2.85 – 3.25 V		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Ground	• O2S front heater voltage < 1.92 – 2.21 V		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Short To Battery Plus	• O2S front heater driver temperature > 160.0 – 200.0° C • Or • O2S front heater driver output current > 8.0 – 12.0 A	• Modeled EGT @ O2S front >= -273° C • Actuator commanded on	• 2.5 s • Continuous .	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0033 Turbocharger/Supercharger Bypass Valve "A" Control Circuit	Turbocharger Bypass (TCBY) Open Circuit	• Voltage lower range 1.92 – 2.21 V • Voltage upper range 2.85 – 3.25 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous .	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger Bypass (TCBY) Short To Battery Plus	• Current > 4.0 – 7.0 A • Temperature > 160 – 200° C (hardware values)	• Actuator commanded on			to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0034 Turbocharger/Supercharger Bypass Valve "A" Control Circuit Low	Turbocharger Bypass (TCBY) Short To Ground	• Voltage < 1.92 – 2.21 V (hardware values)	• Actuator commanded off	• 1.0 s • Continuous .	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Open Circuit	• O2S rear heater voltage lower range 1.92 – 2.21 V • O2S rear heater voltage upper range 2.85 – 3.25 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Ground	• O2S rear heater voltage < 1.92 – 2.21 V	• Engine not in start process	• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Short To Battery Plus	• O2S rear heater driver temperature > 160.0 – 200.0° C • O2S rear heater driver output current > 8.0 – 12.0 A	• Modeled EGT @ O2S rear >= 300° C • Actuator commanded on • Engine not in start process	• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0045 Turbocharger/Supercharger Boost Control "A" Circuit/Open	Turbocharger (TC) Boost Pressure Control Open Circuit	• Bypass valve driver load resistance > 200 kΩ	• Deviation between actual and filtered boost pressure actuator position <= 5.0% • Boost pressure control not active • Time delay > 1.0 s	• 0.4 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0049 Turbocharger/Supercharger "A" Turbine Overspeed	Turbocharger (TC) Boost Pressure Control Out Of Range High	• 1.8L Turbocharger speed >= 240,002 RPM • 2.0L Turbocharger speed >= 213,000 RPM • IAT @ throttle >= 336° C • 1.8L For time >= 6.0 s • 2.0L For time >= 25.5 s	• Engine running	• 2.6 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0068 MAP/ MAF - Throttle Position Correlation	Manifold Absolute Pressure (MAP) Sensor Large Leakage Detection	• Diff. MAP set point vs. actual MAP < -15.0 – -10.0 kPa	• Fast throttle adaptation finished • MAP gradient -200.00 – 200.00 kPa/s • Vehicle speed <= 2 km/h • Time after engine start > 5.0 s • Engine speed lower range > 576 RPM • Engine speed upper range < 3,000 RPM • IAT @ manifold > -48° C • ECT @ cylinder block > -48° C • Pressure quotient @ throttle 0.10 – 0.60 [-] • Load dynamic conditions: • Dynamic engine speed < 8,160 RPM • Dynamic air mass < 25.01 mg/stk	• 5.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Air (IA) System Rationality Check	• Throttle opening area correction included controller and adaptation < -60.0% • Lambda correction included controller and adaptation -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Turbocharger boost pressure 135.0 kPa • BARO 73.0 – 107.50 kPa			
P0070 Ambient Air Temperature Sensor Circuit "A"	COM: Ambient Air Temperature (AAT) Sensor Short To Battery / Open Circuit	• AAT sensor voltage (hardware values) > 4.50 V		• 2.0 s • Continuous	• 2 DCY	– Check the Outside Air Temperature Sensor -G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/Performance	Ambient Air Temperature (AAT) Sensor Cross Check	• High side: reference measuring • Diff. AAT @ cold start vs. IAT @ manifold @ cold start > 20.0 K • Diff.AAT @ cold start vs. ECT @ cylinder block @ cold start not calibrated [K] • Diff. AAT @ cold start vs. ECT @ radiator outlet @ cold start > 20.0 K • Min. amount of faulty reference measurements to detect defective sensor 2.00 [-] OR • Low side: reference measuring • Diff. IAT @ manifold @ cold start vs. AAT @ cold start > 20.0 K • Diff. ECT @ cylinder block @ cold start vs. AAT @ cold start not calibrated [K] • Diff. ECT @ radiator outlet @ cold start vs. AAT @ cold start > 20.0 K • Min. amount of faulty reference measurements to detect defective sensor 2.00 [-]	• Engine off time >= 360.00 [min] • Engine off time plausible • Time after engine start < 6553.5 s • Depending on temperature slope @ cold start: • Diff. actual IAT @ manifold vs. IAT @ manifold @ start of DCY < 256.0 K • Diff. actual ECT @ cylinder block vs. ECT @ cylinder block @ start of DCY not calibrated [K] • Diff. actual ECT @ radiator outlet vs. ECT @ radiator outlet @ start of DCY < 256.0 K • Diff. actual AAT vs. AAT @ start of DCY < 256.0 K • For time >= 0.1 s • Depending on meanvalue condition • Mean value of all temperature sensors @ cold start >= -256° C • Number of valid sensors >= 2.00 [-] • Depending on block heater / solar radiation detection • Time after engine start >= 0.5 s • Vehicle speed >= 20 km/h • For time >= 20.0 s • Diff. actual IAT @ manifold vs. min. IAT @ manifold < 4.5 K	• 0.1 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ "3.6.24 Outside Air Temperature Sensor G17 , Checking", page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Diff. actual ECT @ cylinder block vs. min. ECT @ cylinder block not calibrated [K] • Diff. actual AAT vs. min. AAT < 4.5 K • Diff. actual ECT @ radiator outlet vs. min. ECT @ radiator outlet < 4.5 K			
P0072 Ambient Air Temperature Sensor Circuit "A" Low	COM: Ambient Air Temperature (AAT) Sensor Short To Ground	• AAT sensor voltage < 0.10 V (hardware values)		• 2.0 s • Continuous	• 2 DCY	– Check the Outside Air Temperature Sensor - G17- . Refer to ⇒ “3.6.24 Outside Air Temperature Sensor G17 , Checking”, page 895 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0087 Fuel Rail/System Pressure - Too Low Bank 1	Fuel Rail Pressure (FRP) Out Of Range Low	• Deviation between reference fuel pressure set point and current fuel pressure > 2,000.10 kPa • Case 1: • Deviation lambda of controller included adaptation -50.0 – 50.0% • High pressure controller output > 30 mg • Fuel pressure < 2,500.0 kPa • Case 2: • Fuel pump at max limit • Mass fuel flow set point not calibrated mg/stk • Fuel pressure not calibrated kPa	• General: • Engine speed > 608 – 6,816 RPM • Fuel mass set point 15.01 – 1,389.0 mg/stk • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not active • Full load not calibrated • Catalyst purge not calibrated • Lambda control not calibrated • Evap purge functionality diagnosis not calibrated • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/stk • For time >= 5.0 s	• 2.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
	Fuel Rail Pressure (FRP) Rationality Check Low	• Deviation lambda of controller included adaptation -50.0 – 50.0% • High pressure controller output > 35 mg • Deviation between fuel pressure set point and current fuel pressure > 2,000.10 kPa • Fuel pressure < 2,500.0 kPa	• Fuel mass set point upper range < 100.32 – 172.41 mg/stk • Fuel mass set point gradient -1,389.0 – 2.20 mg/stk • For time >= 1.2 s • Depending on canister purge: • Canister load not calibrated [-] • Evap purge valve not calibrated	• 5.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0088 Fuel Rail/ System Pressure - Too High Bank 1	Fuel Rail Pressure (FRP) Out Of Range High	• Deviation between fuel pressure set point and current fuel pressure < -2,000.10 kPa • Deviation lambda of controller included adaptation -50.0 – 50.0% • Case 1: • High pressure controller output < -30 mg • Case 2: • Flow control valve open • Mass fuel flow set point > 15.01 mg/stk	• General: • Engine speed 608 – 6,816 RPM • Fuel mass set point 15.01 – 1,389.0 mg/stk • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not active • Full load not calibrated • Catalyst purge not calibrated • Lambda control not calibrated • Evap purge functionality diagnosis not calibrated • Duel pressure setpoint gradient <= 200.06 [kPa] • And • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/stk • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/stk • Fuel mass set point gradient -1,389.0 – 2.20 mg/stk • For time >= 1.2 s • Depending on canister purge: • Canister load not calibrated [-] • Evap purge valve not calibrated [-]	• 5.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0090 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel Volume Regulator Control Open Circuit	• Voltage high side < 1.87 – 2.26 V • Voltage low side > 2.78 – 3.33 V	• Engine speed 0 RPM • Fuel cut off active • Actuator commanded off	• 0.2 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
		• Low and high side off: • Voltage low side > 2.78 – 3.33 V • Voltage high side < 1.87 – 2.26 V • Low and high side on: • Current low side < 12.2 – 15.0 A • Current high side < 13.5 – 16.5 A	• Engine speed > 600 RPM • Fuel cut off not active • Actuator commanded on			
P0091 Fuel Pressure Regulator 1 Control Circuit Low	Fuel Volume Regulator Control Short To Ground (High Side)	• Current high side > 13.5 – 17.0 A	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded on	• 0.2 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
	Fuel Volume Regulator Control Short To Ground (Low Side)	• Voltage low side < 1.87 – 2.26 V (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded off			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0092 Fuel Pressure Regulator 1 Control Circuit High	Fuel Control Valve Short To Battery Plus (Low Side)	• Current low side > 13.5 – 17.0 A	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded on	• 0.2 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Fuel Pressure Regulator Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
	Fuel Control Valve Short To Battery Plus (High Side)	• Voltage high side < 2.78 – 3.33 V (hardware values)	• Ignition on • Ignition off (during ECM keep alive-time) • Actuator commanded off •			
P00AF Turbocharger/Supercharger Boost Control "A" Module Performance	Turbocharger (TC) Boost Pressure Control Functional Check - Transient Check	• Boost pressure actuator position controller output > 98.0%	• Time after engine start >= 4.0 s • ECT > -40° C • AAT > -40° C • Catalyst heating not active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
		• Boost pressure actuator position controller output < -98.0%				
	Turbocharger (TC) Boost Pressure Control Functional Check	• Deviation boost pressure actuator position controller > 12.0 – 100.0%	• Time after engine start >= 4.0 s • ECT > -40° C • AAT > -40° C • Boost pressure control active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/Performance	Manifold Absolute Pressure (MAP) Sensor Engine Standing: Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Case 2: non charged engine • Diff. BARO mean value vs. MAP mean value n.a. kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) n.a. kPa • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time n.a. kPa	• Case A: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case B: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. BARO mean value vs. MAP mean value n.a. kPa				
	Manifold Absolute Pressure (MAP) Sensor ECM Keep Alive-Time: Cross Check	• Case 1: Charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure <= 7.50 kPa • Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Case 2: Non charged engine • Diff. BARO mean value @ ECM keep alive vs. MAP mean value @ ECM keep alive time > n.a. kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Intake Air (IA) System Rationality Check	• Throttle opening area correction included controller and adaptation > 40.0% • Lambda correction included controller and adaptation < -28.0%	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active	• 5.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle opening area correction included controller and adaptation < 40.0% • Lambda correction included controller and adaptation > 28.0%	• Time after engine start > 5.0 s • Turbocharger boost pressure < 135.0 kPa • BARO 73.0 – 107.50 kPa			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Absolute Pressure (MAP) Sensor Short To Ground	• Intake manifold pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery Plus	• Intake manifold pressure sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature (IAT) Sensor Cross Check	• High side: reference measuring • Diff. IAT @ manifold @ cold start vs. AAT @ cold start > 20.0 K • Diff. IAT @ manifold @ cold start vs. ECT @ cylinder block @ cold start not calibrated [K] • Diff. IAT @ manifold @ cold start vs. ECT @ radiator outlet @ cold start > 20.0 K • Min. amount of faulty reference measurements to detect defective sensor 2.00 [-] OR • Low side: reference measuring • Diff. AAT @ cold start vs. IAT @ manifold @ cold start > 20.0 K • Diff. ECT @ cylinder block @ cold start vs. IAT @ manifold @ cold start > 20.0 K • Diff. ECT @ radiator outlet @ cold start vs. IAT @ manifold @ cold start > 20.0 K	• Engine off time >= 360.00 [min] • Engine off time plausible • Time after engine start < 6553.5 s • Depending on temperature slope @ cold start: • Diff. actual IAT @ manifold vs. IAT @ manifold @ start of DCY < 256.0 K • Diff. actual ECT @ cylinder block vs. ECT @ cylinder block @ start of DCY not calibrated [K] • Diff. actual ECT @ radiator outlet vs. ECT @ radiator outlet @ start of DCY < 256.0 K • Diff. actual AAT vs. AAT @ start of DCY < 256.0 K • For time >= 0.1 s • Depending on mean value condition • Mean value of all temperature sensors @ cold start >= -256° C • Number of valid sensors >= 2.00 [-] • Depending on block heater / solar radiation detection • Time after engine start >= 0.5 s • Vehicle speed >= 20 km/h • For time >= 20.0 s • Diff. actual IAT @ manifold vs. min. IAT @ manifold < 4.5 K	• 0.1 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Min. amount of faulty reference measurements to detect defective sensor 2.00 [-]	• Diff. actual ECT @ cylinder block vs. min. ECT @ cylinder block not calibrated [K] • Diff. actual AAT vs. min. AAT < 4.5 K • Diff. actual ECT @ radiator outlet vs. min. ECT @ radiator outlet < 4.5 K			
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature (IAT) Sensor Short To Ground	• IAT sensor voltage < 0.10 V		• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature (IAT) Sensor Open Circuit	• IAT sensor voltage > 4.50 V		• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor No Change On Signal	• Difference between maximum and minimum temperature of ECT @ cylinder block < 2° C	• ECT @ cylinder block > -256° C • IAT @ throttle -48 – 143° C • depending on thermostat control: • ECT @ cylinder block <= 82° C • or • ECT @ cylinder block >= 98° C • Engine running • And • Engine part load • Or • Engine full load • Engine speed > 1300 rpm • Vehicle speed >= 50 km/h • Engine load > 6.00 % • For time >= 30.0 – 60.0 s • Engine idle • Vehicle speed < 255 km/h • Or • Fuel cut off active • Or • Engine stop for time >= 30.0 – 60.0 s • Time after engine start > 100.0 s	• 120.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check Low	• Difference between modelled and measured cylinder block temperature > 10° C	• ECT @ cylinder block -128 – 127° C • Time after engine start > 60.0 s	• 10.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check Inappropriately Low	• Diff. min temperature of cross check sensors vs. ECT @ cylinder block @ engine start >= 10° C	• Cross checks finished	• 1.0 s • Once / DCY		
	Engine Coolant Temperature (ECT) Sensor @ Cylinder Block Rationality Check High	• ECT @ cylinder block @ engine start > 40 – 80° C	• Cross checks finished • Engine running • Engine off time >= 240.00 min • Valid AAT signal for time >= 2.0 s • Valid engine stop signal for time >= 3.0 s	• 1.0 s • Once / DCY		
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature (ECT) Sensor Short To Ground	• ECT sensor voltage < 0.30 V		• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62, Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83, Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature (ECT) Sensor Short To Battery / Open Circuit	• ECT sensor voltage > 4.90 V	• IAT at throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/Performance	Throttle Position Sensor (TPS) 1 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 1 >= 1.0 [-] • Relative mass air flow integral from TPS 1 > 60.0 [-]	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active	• 0.01 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
		• Difference between TPS 1 and TPS 2 > 6.499° TPS		• 0.3 s • Continuous		
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor (TPS) 1 Short To Ground	• Throttle position sensor 1 voltage < 0.17 V		• 0.2 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor (TPS) 1 Short To Battery Plus	• Throttle position sensor 1 voltage > 4.83 V		• 0.2 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Short To Ground	• O2S sensor voltage < 0.15 V	• Engine running	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Short To Battery Plus	• O2S sensor voltage > 5.20 – 5.35 V	• Engine running	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Dynamic Path Response Check	• Average check • Mean value of normalised signal amplitude >= 1.0 [-] • Ratio check • Ratio of failed diagnostic cycle not calibrated [-]	• Conditions range 1: (standard parameters) • General conditions: • Time after engine start not calibrated s • ECT >= -48° C • Vehicle speed not calibrated km/h • Integrated air mass after gear change not calibrated kg • MAF 0.0 – 1,389.0 mg/stk • Integrated air mass per cylinder not calibrated kg • Static conditions: • O2S front ready • Lambda stimulation active • Lambda control value -35.0 – 35.0% • Engine speed 928 – 3,008 RPM • MAF to activate diagnosis function 150.0 – 600.0 mg/stk • MAF per segment > 18.0 kg/h • Normalized integrated fuel mass in oil < 255.0 [-] • Catalyst purge not active • Limited dynamic conditions: • Integrated air mass after dynamic conditions are fulfilled not calibrated g • Dynamic engine speed < 150 RPM	• 4.4 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dynamic MAF not calibrated mg/stk • Dynamic MAF per segment < 30.0 kg/h • Dynamic lambda not calibrated % • Change of dynamic torque < 0.07 [-] • Conditions range 2: (Diagnosis carried out together with the catalyst efficiency diagnosis) • General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1344 – 3008 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-] • Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temperature conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk • Air mass during diagnosis not calibrated mg/stk • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated % • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Case 1: • Evap purge valve not calibrated • Case 2: • Canister load calculation not calibrated • Evap purge valve not calibrated • Case 3: • Canister load not calibrated • Evap purge valve not calibrated • Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass to start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors (O2S) Front Delay Path Response Check	• Normalised lambda controller value vs. modeled lambda value >= 1.0 [-]	• General conditions • O2S front ready • Time after engine start not calibrated s • MAF to activate diagnosis function not calibrated mg/stk • Integrated air mass per cylinder >= 0.42 – 2.0 kg • Vehicle speed not calibrated km/h • Static condition • Engine speed 1,056 – 3,008 RPM • MAF per cylinder 15.0 – 150.0 kg/h • Vehicle speed not calibrated km/h • Dynamic conditions • Dynamic engine speed < 288 RPM • Dynamic torque < 80.0 Nm • Absolute dynamic MAF < 70.0 kg/h • Activation due to canister purge • Canister purge no purge • Canister purge not active • Canister purge wait ramp open • Canister purge min purge • Canister load known • Canister purge n.a.			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Moving mean value canister load <= 1.80 [-]			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors (O2S) Heater Front Functional Check	• O2S ceramic temp. < 730° C	• O2S heater commanded on • For time >= 10.0 s	• 20.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Short To Ground	• O2S sensor voltage < 0.15 V	• O2S heater active	• 0.6 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Short To Battery	• O2S sensor voltage > 5.2 – 5.35 V	• O2S heater active	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Rich To Lean Transition Response Check	• Gradient sensor voltage < 1,000.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Air mass during diagnosis not calibrated mg/stk • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow not calibrated • Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013B O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Lean To Rich Transition Response Check	• Gradient sensor voltage < 650.0 mV/s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Air mass during diagnosis not calibrated mg/stk • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow not calibrated • Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013E O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Rich To Lean Transition Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Air mass during diagnosis not calibrated mg/stk • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow not calibrated • Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P013F O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Lean To Rich Transition Delayed Response Monitoring, Delay Measurement	• Sensor signal delay time > 0.9 s (arithmetic average)	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < | 0.25 | [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Number of checks 2.0 [-] • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Air mass during diagnosis not calibrated mg/stk • MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions: • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge flow not calibrated • Close the gap conditions: • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Open Circuit	• Internal resistance of O2S (binary) > 65,534.0 Ω		• 2.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors (O2S) Heater Rear Out Of Range High	• Internal resistance of O2S (binary) 700.0 – 65,534.0 Ω	• O2S heater commanded on • For time >= 10.0 s	• 20.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .
P0149 Fuel Timing Error	Fuel Injection Valves Out Of Range Low	• Boost voltage < 30.0 V • Boost voltage <= 50.0 V	• Engine running >= 0.3 s	• 3.6 s • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Out Of Range High	• Boost voltage > 75.0 V				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0171 System Too Lean Bank 1	Fuel System Too Lean	• Lambda controller output > 35.0%	• Lambda control closed loop • Air mass > 60.00 mg/stk • Engine speed > 576 RPM • 1.8L ECT @ cylinder block > 55° C • 2.0L ECT @ cylinder block > 60° C • IAT @ manifold > -48° C • AAT > -48° C • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output not calibrated • Upper limit of lambda controller output not calibrated • Evap purge flow at min. value	• 60.0 s • Continuous	• 2 DCY	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0172 System Too Rich Bank 1	Fuel System Too Rich	• Lambda controller output < -35.0%	• Lambda control closed loop • Air mass > 60.00 mg/stk • Engine speed > 576 RPM • 1.8L ECT @ cylinder block > 55° C • 2.0L ECT @ cylinder block > 60° C • IAT @ manifold > -48° C • AAT > -48° C • Oil dilution not detected • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value	• 60.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors, Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Mod-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
						ule J538 , Testing”, page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
P0190 Fuel Pressure Regulator 1 Control Circuit/ Open	Fuel Pressure (LP) Sensor Short To Battery / Open Circuit	• High fuel pressure sensor voltage > 4.80 V		• 2.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0191 Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	Fuel Rail Pressure (FRP) Out Of Range High	• Fuel pressure > 27,900.09 kPa	• Engine speed > 608; < 8,160 RPM • Time after engine start > 5.0 s	• 5.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P0192 Fuel Rail Pressure Sensor Circuit Low Bank 1	Fuel Pressure (LP) Sensor Short To Ground	• High fuel pressure sensor voltage < 0.20 V		• 2.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P01C4 Fuel Pressure Sensor "A" Circuit Range/Performance	Fuel Rail Pressure (FRP) Sensor rationality check low	• Deviation lambda of controller included adaptation < -45.00 % • And • High pressure controller output > 8 mg	• General: • Engine speed 608 – 1,088 rpm • Fuel mass setpoint 1.99 – 20.01 mg/stk • Time after change to DFI not equipped [s] • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated • Lambda control closed loop • Evap purge functionality diagnosis not active • Fuel pressure setpoint gradient <= 200.06 kPa • And • Depending on low dynamic conditions: • Fuel mass setpoint lower range > 1.99 mg/stk • For time >= 5.0 s • Fuel mass setpoint upper range < 100.32 – 172.41 mg/stk • Fuel mass setpoint gradient -1389.00 – 2.20 mg/stk • For time >= 1.2 s • And depending on canister purge: • Canister load <= 0.70 - • Or	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge valve not active or closed			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Rail Pressure (FRP) Sensor rationality check high	• Deviation lambda of controller included adaptation > 30.00 % • And • High pressure controller output < -10 mg	• General: • Engine speed 608 – 1,088 rpm • Fuel mass setpoint 4.01 – 29.99 mg/stk • Time after change to DFI not equipped [s] • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated • Lambda control closed loop • Evap purge functionality diagnosis not active • Fuel pressure setpoint gradient <= 200.06 kPa • And • Depending on low dynamic conditions: • Fuel mass setpoint lower range > 1.99 mg/stk • For time >= 5.0 s • Fuel mass setpoint upper range < 100.32...172.41 mg/stk • Fuel mass setpoint gradient -1389.00...2.20 mg/stk • For time >= 1.2 s • And depending on canister purge: • Canister load <= 0.70 - • Or			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge valve not active or closed			
P0201 Cylinder 1 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • And • Injector low side voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector high side switch current > 25.0 A • Or • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) > 9.0 – 14.0 • Or • Injector voltage < 2.0 V • Injector low side switch current > 25.0 A • Or • Injector voltage < 2.0 V • Injector low side switch current (hardware values)> 9.0 – 14.0 • Or • Injector load resistance to ground and battery > 20.0 Ω	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector low side switch current > 25.0 A • Or • Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current > 25.0 A • or • power stage temperature > 150° C	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0202 Cylinder 2 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0203 Cylinder 3 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0204 Cylinder 4 Injector "A" Circuit	Fuel Injection Valves Open Circuit	• Fault pattern for open circuit via power stage diagnosis detected • Injector low side voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Fuel Injection Valves Short Circuit	• Fault pattern for short circuit via power stage diagnosis detected • Injector current rise time during peak phase < 0.064 ms				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Fuel Injection Valves Electrical Error	• Indeterminate fault pattern via power stage diagnosis detected • Injector low side voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector high side switch current driver stage internal value • Injector low side voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current driver stage internal value • Injector voltage < 2.0 V • Injector low side switch current (hardware values) driver stage internal value • Injector load resistance to ground and battery > 20.0 Ω • Injector low side switch current driver stage internal value	• Engine running			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Injector load resistance to ground and battery > 20.0 Ω • Injector high side switch current driver stage internal value	• ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s			
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/Performance	Throttle Position Sensor (TPS) 2 Rationality Check	• Normalised difference between measured and modeled value of mass air flow from TPS 2 >= 1.0 [-] • Relative mass air flow integral from TPS 2 > 60.0 [-]	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active	• 0.01 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor (TPS) 2 Short To Ground	• Throttle position sensor 2 voltage < 0.17 V		• 0.2 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor (TPS) 2 Short To Battery Plus	• Throttle position sensor 2 voltage > 4.83 V		• 0.2 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0234 Turbocharger/Supercharger "A" Overboost Condition	Turbocharger (TC) Boost Pressure Control Out Of Range High	• Boost pressure > calculated max. plausible value • Boost pressure deviation < 209.90 – 265.0 kPa • Turbocharger protection active	• Engine running • Accelerator pedal value > 0.0% • Fuel cut off n.a. • Difference between boost pressure and barometric pressure >= 20.0 kPa	• 1.3 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .
P0236 Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance	Turbocharger (TC) Boost Pressure Sensor Engine Standing: Cross Check	• Diff. turbocharger boost pressure vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Diff. BARO vs. MAP <= 7.50 kPa	• Case 1: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a. • For time >= 10.0 s • Case 2: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle n.a.	• 3.0 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Turbocharger (TC) Boost Pressure Sensor ECM Keep Alive-Time: Cross Check		• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
P0237 Turbocharger/Supercharger Boost Sensor "A" Circuit Low	Turbocharger (TC) Boost Pressure Sensor Short To Ground	• Turbocharger boost pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0238 Turbocharger/Supercharger Boost Sensor "A" Circuit High	Turbocharger (TC) Boost Pressure Sensor Short To Battery Plus	• Turbocharger boost pressure sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ "3.6.8 Charge Air Pressure Sensor G31 , Checking", page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 .
P025A Fuel Pump Module "A" Control Circuit/ Open	Fuel Pump (FP) Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • Signal voltage upper range (hardware values) < 2.84 – 3.25 V	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .
P025C Fuel Pump Module "A" Control Circuit Low	Fuel Pump (FP) Short To Ground	• Signal voltage < 1.92 – 2.21 V (hardware values)	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P025D Fuel Pump Module "A" Control Circuit High	Fuel Pump (FP) Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C • Signal current > 100 – 180 mA	• Commanded PWM 9.80 – 92.20% • Fuel pump commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .
P0261 Cylinder 1 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current < 25.0 A • Injector driver low side switch current < 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current > 25.0 A				
P0262 Cylinder 1 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current > 25.0 A				
P0264 Cylinder 2 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current < 25.0 A • Injector driver low side switch current < 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current > 25.0 A				
P0265 Cylinder 2 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current > 25.0 A				
P0267 Cylinder 3 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current < 25.0 A • Injector driver low side switch current < 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current > 25.0 A				
P0268 Cylinder 3 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ "3.6.14 Fuel Injectors , Checking", page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current > 25.0 A				
P0270 Cylinder 4 Injector "A" Circuit Low	Fuel Injection Valves Short To Ground	• Fault pattern for short to ground via power stage diagnosis detected • Injector voltage < 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .
	Injection Valves Short To Ground (Low Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current < 25.0 A • Injector driver low side switch current < 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Fuel Injection Valves Short To Ground (High Side)	• Injector driver voltage < 2.0 V • Injector driver high side switch current > 25.0 A				
P0271 Cylinder 4 Injector "A" Circuit High	Fuel Injection Valves Short To Battery Plus	• Fault pattern for short to battery plus via power stage diagnosis detected • Injector voltage > 2.0 V	• Engine stop not active • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated s	• 8,640.0° CRK • Continuous	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Injection Valves Short To Battery Plus (Low Side)	• Injector driver voltage > 2.0 V • Injector driver low side switch current > 25.0 A	• Engine running • ECT @ cylinder block >= -30° C • Engine speed < 7,000 RPM • Injection time not calibrated ms	• 720° CRK • Continuous		
	Injection Valves Short To Battery Plus (High Side)	• Injector driver voltage > 2.0 V • Injector driver high side switch current > 25.0 A				
P0299 Turbocharger/Supercharger "A" Underboost Condition	Turbocharger (TC) Boost Pressure Control Out Of Range Low	• Boost pressure < calculated min. plausible value • Boost pressure deviation > 5.0 kPa	• Engine running • Turbo charger bypass valve closed • For time >= 1.0 s • Pressure ratio before charger set point > 1.30 [-] • For time >= 1.2 – 1.9 s • Engine speed > 2,208 – 2,750 RPM • Barometric pressure > 73.0 kPa • ECT > -10° C • No cylinder is shut off • Fuel tank level not calibrated %	• 4.0 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Sensor - G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Intake Manifold Adaptive Value Check	• Turbo charger actuator set point >= 17.0 – 20.0%	• Engine running • Conditions: • For time >= 0.5 s • Difference between filtered boost pressure and basic boost pressure > 40.01 kPa • Difference between filtered boost pressure set point and basic boost pressure > 40.01 kPa • Boost pressure control deviation < 20.0 kPa • Boost pressure set point < 16.0 kPa • Actual boost pressure < 30.0 kPa • Difference between current boost pressure set point and basic boost pressure > 3.0 kPa • ECT > -20° C • IAT @ throttle > 0° C • Engine speed 2,500 – 6,800 RPM • Conditions: • For time >= 5,000.0 ms • Difference between actual turbocharger speed and maximum turbocharger speed set point > 9,003 RPM • Conditions: • For time >= 1,000.0 ms • No gear shift • Fuel cut off not active	• 0.01 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Multiple)	• Number of cylinders with emission threshold misfire within 4,000 revolutions >= 2.0 [-] • Or • Number of cylinders with emission threshold misfire within 1,000 revolutions >= 2.0 [-]	• Emission threshold misfire detected	• 1,000 rev • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Number of cylinders with catalyst damaging misfire >= 2.0 [-]	• Catalyst damaging misfire detected	• 200 rev • Continuous	• Immediately	with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • 1.8L Catalyst damaging misfire rate > 4.72 - 20.83 % • 2.0L Catalyst damaging misfire rate > 5.00 - 31.25 %	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM • Time after engine start not calibrated s • 1.8L Engine load > 5.26 - 44.49 % • 2.0L Engine load > 4.36 – 47.00 % • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK	• 200 rev • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25 %		• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40 %	• Dynamic of ignition angle not calibrated ° CRK • Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 4.72 - 20.83 %	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air).

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25 %	• Time after engine start not calibrated s • Engine load > 6.54 – 43.0% • Depending on ECT @ cylinder block @ start	• 1,000 rev • Continuous		– Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40 %	• ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK • Rough road not detected	• 4 x 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 4.72 - 20.83 %	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25 %	• Time after engine start not calibrated s • Engine load > 6.54 – 43.0% • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40 %	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Catalyst damage misfire: • Catalyst damaging misfire rate > 4.72 - 20.83 %	• Initial engine speed > 550 RPM • Engine speed > 550 RPM • Engine speed < 6,848 RPM	• 200 rev • Continuous	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils
		• Emission threshold misfire within 1,000 rev: • Emission threshold misfire rate (MR) > 2.25 %	• Time after engine start not calibrated s • Engine load > 6.54 – 43.0% • Depending on ECT @ cylinder block @ start • ECT @ cylinder block @ engine start <= -48° C • Then activation if • ECT @ cylinder block >= 20° C • ECT @ cylinder block @ engine start > -48° C • Fuel cut off not active • Single fuel cut off not active • Number of fade out cylinders < 2.0 [-] • Dynamic manifold air pressure not calibrated kPa • Dynamic throttle position not calibrated ° TPS/s • Dynamic of engine load not calibrated % • Engine not calibrated • Engine speed not calibrated RPM • Dynamic of ignition angle @ idle speed not calibrated ° CRK • Dynamic of ignition angle not calibrated ° CRK	• 1,000 rev • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Emission threshold misfire within 4,000 rev: • Emission threshold misfire rate (MR) > 2.40 %	• Rough road not detected	• 4 x 1,000 rev • Continuous		with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0326 Knock /Combustion Vibration Sensor 1 Circuit Range/Performance Bank 1 or Single Sensor	Knock Sensor (KS) Rationality Check Low	• For time >= 3.0 s • Difference between knock sensor signal and average knock sensor signal < 0.0 – 0.12 V	• ECT @ cylinder block > 60° C • Air mass > 229.0 mg/stk	• 4.3 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .
P0327 Knock /Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor (KS) Out Of Range	• Sensor signal < 0.12 – 0.31 V	• ECT @ cylinder block > 60° C • Air mass > 229.0 mg/stk • Engine speed > 2,016 RPM	• 4.0 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0335 Crank shaft Position Sensor "A" Circuit	Crankshaft Position (CKP) Sensor Activity Check	• Case 1: • Counted exhaust camshaft signals without synchronization >= n.a. [-] • Counted intake camshaft signals without synchronization n.a. [-] • Case 2: • Counted exhaust camshaft signals without synchronization >= n.a. [-] • Counted intake camshaft signals without synchronization >= 17.0 [-]	• Signal edges @ selected camshaft signal detected • Choice of: • Ignition off • Engine speed > 380 RPM • Engine stalling >= 1.0 s • Synchronization test incorrect • Engine speed >= 380 RPM • Engine running • Engine stalling >= 5.0 s • Backwards rotation not detected • Engine speed >= 400 RPM • Engine stop active	• 0.01 s • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .
	Crankshaft Position (CKP) Sensor CPDD - Crankshaft Position Out Of Range	• Pulse width backwards < 62; > 150 µs • For number of pulse widths outside tolerance > 1.0 [-] • Pulse width forwards < 15; > 62 µs • For number of pulse widths outside tolerance > 1.0 [-]	• Engine speed > 0.0; <= 3,000 RPM	• 1,800.0° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0336 Crankshaft Position Sensor "A" Circuit Range/Performance	Crankshaft Position (CKP) Sensor Rationality Check	• Crankshaft reference gap not detected	• General conditions: • Reference gap of relucter wheel detected • And • Case 1: • Ignition off • Engine speed > 380 rpm • Engine stalling >= 1.0 s • Or • Case 2: • Eengine speed >= 380 rpm • Or • Engine running • And • Engine stalling >= 5.0 s • Or • Case 3: • Backwards rotation not detected • Or • Case 4: • Engine speed >= 400 rpm • Engine stopped	• 2,160.0° CRK • Continuous	• 2 DCY	– Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869 – Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position (CKP) Sensor Rationality Check	• Counted teeth vs. reference >= |1|...<= |2| [-]	• General conditions: • Engine speed > 320 rpm • And • Case 1: • Ignition off • Engine speed > 380 rpm • Engine stalling >= 1.0 s • Or • Case 2: • Engine speed >= 380 rpm • Or • Engine running • And • Engine stalling >= 5.0 s • Or • Case 3: • Backwards rotation not detected • Or • Case 4: • Engine speed >= 400 rpm • Engine stopped	• 1,800.0° CRK • Continuous		
	Crankshaft Position (CKP) Sensor Tooth Period Rationality Check	• Case 1: • Engine speed > 3000 rpm • Time between falling signal edges 0 – 50 µs • Case 2: • Engine speed <= 3000 rpm • Time between signal edges < 30 µs	• Engine speed >= 400 rpm	• 45,720.0° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position Sensor Out Of Range	• Counted teeth vs. reference >= 1000000; <= 1000 μs	• Engine running	• 3600.00° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Crankshaft Position Sensor Out Of Range	• Segment adaptation >= 0.70 %	• Fuel cut off active • Delay time >= 5760.00° CRK • And • Diff. actual air mass vs. previous air mass <= 20.01 – 39.99| mg/stk • Engine load <= 20.00 % • Dynamic throttle position <= 269.50 – 398.40° TPS/s • Rough road not detected • Engine roughness signal not valid • Segments in fuel cut-off mode >= 32.00 [-] • Segment adaptation finished • Engine speed 2,016 – 5,024 rpm • 6 cylinder engine: • Diff. between adapted value of cylinder 1 and cylinder 6 not calibrated [%] • Diff. between adapted value of cylinder 4 and cylinder 2 not calibrated [%] • Diff. between adapted value of cylinder 3 and cylinder 5 not calibrated [%] • 4 cylinder engine: • Diff. between adapted value of cylinder 1 and cylinder 3 < 0.70 %	• 180.00 [°CRK]		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Diff. between adapted value of cylinder 2 and cylinder 4 < 0.70 %	• Continuous		
P0340 Camshaft Position Sensor "A" Circuit Bank 1 or Single Sensor	Camshaft Position (CMP) Intake Sensor Signal Activity Check	• No change on signal >= 3.00 [-]	• Engine speed >= 400 RPM	• 2,520.0° CRK • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Camshaft Position (CMP) Intake Sensor Rationality Check	• Ratio between measured segment time ratio and specified camshaft angle ratio > 2.75 [-] • Or • Ratio between measured segment time ratio and specified camshaft angle ratio < 0.36 [-] • Or • Offset between camshaft and crankshaft < -79.00° CRK • Or • Offset between camshaft and crankshaft > 15.00° CRK	• Engine speed 400 – 8160 RPM	• 990.00° CRK • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 , Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Camshaft Position (CMP) Intake Sensor Out of Range	• Offset between camshaft and crankshaft < -79.0° CRK • Or • Offset between camshaft and crankshaft > 15.00° CRK	• Engine synchronization not validated • Failure by exhaust camshaft sensor detected	• 450.0° CRK • Once / DCY		
	Camshaft Position (CMP) Intake Sensor Signal Activity Check	• Segment time value < 50 µs	• Engine speed 400 – 8,160 RPM	• 1,440.0° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P039B Cylinder 1 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03A5 Cylinder 2 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03AF Cylinder 3 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking”, page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P03B9 Cylinder 4 Pressure Too High	Knock Control Function Check	• Slow detection: • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 9,000.0 – 11,700.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • For time >= 5,760.0 – 6,840.0° CRK • Ratio between knock sensor and noise level in pre knock window > 3.50 – 5.0 [-] • Ratio between knock sensor and knock threshold in main knock window > 2.0 – 3.0 [-] • For time >= 12,960.0 – 16,740.0° CRK • Torque limitation factor < 0.90 [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Dynamic engine speed not active • Delay time not calibrated seg	• 900.0° CRK • Continuous	• 2 DCY	– This DTC may set due to poor fuel quality or fuel that has aged excessively. If necessary, drain the fuel from the vehicle and replace with fresh fuel. – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the Knock Sensor 1 - G61- . Refer to ⇒ “3.6.21 Knock Sensor 1 G61 , Checking”, page 888 . – Check the Engine Speed Sensor - G28- . Refer to ⇒ “3.6.11 Engine Speed Sensor G28 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Fast detection: • Ratio between knock sensor and knock threshold in main knock window > 1.50 – 2.50 [-] • For time >= 540.0° CRK • Ratio between knock sensor and noise level in pre knock window > 2.75 – 4.50 [-] • For time >= 360.0° CRK • Case 1: • Ratio between filtered engine roughness and misfire detection threshold <= 0.41 – 0.59 [-] • Case 2: • Ratio between normalised engine roughness and misfire detection threshold n.a. [-] • Case 3: • Ratio between filtered engine roughness and misfire detection threshold n.a. [-] • Ratio between normalised engine roughness and misfire detection threshold n.a. [-]	• Engine running • ECT @ cylinder block > 60° C • Engine speed 1,216 – 6,400 RPM • Engine load n.a. % • Air mass > 403.0 – 501.0 mg/stk • Misfire detection active • Dynamic engine speed not active • Delay time not calibrated seg			Checking", page 869

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Secondary Air Injection (AIR) Functional Check	• Diff. pressure value after secondary air injection vs. pressure value before secondary air activation > 5.0 kPa	• General: • AIR pump ready • Catalyst heating active • AIR finished • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 - • Diff. BARO vs. MAP n.a. kPa • Engine n.a.	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ "3.6.29 Secondary Air Injection Sensor 1 G609 , Checking", page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ "3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking", page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ "3.6.31 Secondary Air System GX24 , Checking", page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0413 AIR System Switching Valve "A" Circuit Open	Secondary Air Injection (AIR) Valve Open Circuit	• Output voltage, lower range >= 1.92 – 2.21 V • Output voltage, upper range <= 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Secondary Air Injection (AIR) Valve Short To Ground	• Output voltage < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .
	Secondary Air Injection (AIR) Valve Short To Battery Plus	• Actuator temperature > 160 – 200° C • Or • Output current > 1.0 – 2.0 A	• Engine running • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0418 AIR System Control "A" Circuit	Secondary Air Injection (AIR) Pump Relay Open Circuit	• Output voltage, lower range 1.92 – 2.21 V • Output voltage, upper range (hardware values) <= 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System NMOG / NMHC / NOX Conversion Capability	• Arithmetic average • Catalyst efficiency not calibrated [-] • EWMA filtered • Catalyst efficiency not calibrated [-] • Arithmetic average, corrected with measured delay and transition time of oxygen sensors rear • Catalyst efficiency > 1.0]-] • EWMA filtered, corrected with measured delay and transition time of oxygen sensors rear • Catalyst efficiency not calibrated [-]	• General conditions: • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear ready • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Three Way Catalytic Converter (TWC). Refer to ⇒ “3.6.32 Three Way Catalytic Converter, TWC Checking”, page 914 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temperature conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S rear <= 1,201° C • Air mass conditions: • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk • Air mass during diagnosis not calibrated mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated • Close the gap conditions:			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active • For arithmetic average value calculation: • Number of checks required for valid result >= 2.0 [-] • For EWMA-filter: • Minimum number of tests per DCY required not calibrated • Step change detection will initiate multiple tests per DCY • Conditions for step change detection: • Relative deviation between new measured value and old EWMA filtered value not calibrated [-] • Number of checks not calibrated [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P043E EVAP System Leak Detection Reference Orifice Low Flow	Evaporative Emission (EVAP) System Out Of Range High	• Evap pump current during reference measurement > 40.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P043F EVAP System Leak Detection Reference Orifice High Flow	Evaporative Emission (EVAP) System Out Of Range Low	• Evap pump current during reference measurement < 15.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	Evaporative Emission (EVAP) Canister Purge Valve Functional Check: Stuck Close	• Ratio actual intake manifold pressure and modeled set point intake manifold pressure < 0.05 [-]	• ECT @ cylinder block > 58° C • BARO > 73.0 kPa • AAT > 5° C • AAT @ start >= 5° C • Diff. BARO vs. filtered MAP >= 33.0 kPa • Diff. BARO vs. filtered MAP > 33.0 – 40.0 kPa • Engine speed < 2,200 RPM • ratio MAF @ manifold and MAF max > 0.07...0.09 [-] • Engine speed < 1,180 RPM • Coasting function not calibrated • Vehicle speed >= 5 km/h • Diff. engine speed vs. filtered engine speed < 90 RPM • Diff. ratio MAF @ manifold and MAF max vs. ratio filtered MAF @ manifold and MAF max < 0.15 [-] • Diff. modeled MAP vs. filtered modeled MAP < 1.50 kPa • Integrated air mass since engine start >= 0.0 – 5,000.0 g • lambda conditions fulfilled • Lambda control active • Lambda control value -30.0 – 30.0% • O2S front 0.95 – 1.05 [-]	• 8.5 s • Once / DCY	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Fuel cut off not calibrated • Case 1: • Integrated air mass @ canister purge valve per driving cycle not calibrated g • Case 2: • Ratio MAF @ canister purge and MAF per cylinder not calibrated [-] • Canister purge sampling rate >= 40.0% • Integrated air mass @ canister purge valve >= 2.1 g • Depending on AAT: • AAT >= 20° C • Canister load <= 0.17 [-] • Or • AAT >= 30; < 20° C • Canister load <= 0.17 [-] • AAT < 30° C • Canister load <= 0.17 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	Evaporative Emission (EVAP) System Small Leak Rationality Check	• Difference pump current vs. rough leak reference current < 0.0 mA • And • For time >= 600.0 s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0444 EVAP System Purge Control Valve "A" Circuit Open	Evaporative Emission (EVAP) Canister Purge Valve Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) > 3.13; <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0445 EVAP System Purge Control Valve "A" Circuit Shorted	Evaporative Emission (EVAP) Canister Purge Valve Short To Ground	• Output voltage (hardware values) 1.92 – 2.21 V	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) <= 98.83% • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .
	Evaporative Emission (EVAP) Canister Purge Valve Short To Battery Plus	• Actuator temperature > 160 – 200° C • Or • Output current > 4.0 – 7.0 A	• Engine start not active • Engine running • Evap purge valve opening signal (PWM) >= 3.13% • Actuator commanded on			
P0447 EVAP System Vent Control Circuit Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range (hardware values) 2.75 – 3.36 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P0448 EVAP System Vent Control Circuit Shorted	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage (hardware values) < 1.85 – 2.28 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current > 4.0 – 7.0 A	• Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	Evaporative Emission (EVAP) System Very Small Leak Rationality Check	• Difference pump current vs. small leak reference current < 0.0 mA • And • Pump current measurement time > 600.0 s • And • Pump current gradient >= 0.30; <= 0.01 mA/s • Pump current gradient < 0.002 mA/s • Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient < 0.002 mA/s • And • Ratio between actual pump current and small leak reference pump current < 1.10 [-] • Difference pump current vs. small leak reference current >= 0.0 mA • And • Pump current gradient >= 0.30; <= 0.01 mA/s	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • Propulsion off time >= 21,600.0 s • Evap purge adaptation < 0.30 [-] • Engine stop (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for leaks. Refer to ⇒ “2.2.4 EVAP System, Checking for Leaks”, page 6 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 . – Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Secondary Air Injection (AIR) Functional Check	• Case 1: • 1.8L Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.51 [-] • 2.0L Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.65 [-] • Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.51 [-] • Case 2: • Diff. expected integrated secondary air pressure pulsations and actual integrated secondary air pressure pulsations n.a. kPa/s • Case 3: • Blockage: Ratio relative measured secondary air pressure and modeled secondary air pressure [tube blocked] < 0.03 [-]	• General: • AIR pump active • Catalyst heating active • AIR active • MAF <= 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • Diff. BARO vs. MAP not calibrated kPa • Engine not calibrated	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 . – Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Leakage: Ratio relative measured secondary air pressure and modeled secondary air pressure [leak diagnosis] < 0.03 [-]				
P0501 Vehicle Speed Sensor "A" Circuit Range/Performance	COM: Vehicle Speed Sensor (VSS) Communication With VSS	• Speed sensor fault value: out of range high failure • Speed sensor fault value: out of range low failure • Speed sensor fault value: rationality check high failure • Speed sensor fault value: rationality check low failure		• 0.5 s • Continuous	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ "3.6.35 Vehicle Speed Signal, Checking", page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
P0502 Vehicle Speed Sensor "A" Circuit Low	Vehicle Speed Sensor (VSS) Short To Ground Vehicle Speed Sensor (VSS) Open Circuit Vehicle Speed Sensor (VSS) Short To Battery Plus	• Diagnostic signal from output driver failure		• 0.5 s • Continuous	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ "3.6.35 Vehicle Speed Signal, Checking", page 920 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • Engine load < 30.47% • (M/T only) • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0507 Idle Control System RPM - Higher Than Expected	Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating not active • ECT @ cylinder block > -48° C • Set point change < n.a. RPM • For time n.a. s • And • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Speed Control (ISC) Function Monitoring: Engine Speed Deviation	• Diff. actual engine speed vs. engine speed set point > 200 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • For time n.a. • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • For time not calibrated s	• 10.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. actual engine speed vs. engine speed set point < -100 RPM • Integrated I-part of idle speed controller n.a.	• General conditions: • Vehicle speed = 0 km/h • Accelerator pedal released by driver • Throttle actuator commanded on • Evap purge flow < 8.0 kg/h • Engine running • Time after engine start not calibrated s • Clutch switch n.a. • Barometric pressure > 70.0 kPa • Catalyst heating active • ECT @ cylinder block > -10° C • Set point change n.a. RPM • For time n.a. s • Additional after dynamic conditions fulfilled: • Gear switch not active • (A/T only) • Accelerator pedal released by driver • Vehicle speed 0 km/h • Engine load < 30.47% • (M/T only) • For time not calibrated s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P050B Cold Start Ignition Timing Performance	Ignition Control (IC) Ignition Timing Monitor @ Idle	• Difference between commanded ignition timing efficiency vs. actual value > 20.0%	• Engine idle speed • Ignition angle efficiency setpoint <= 0.80 [-] • Modeled pressure quotient <= 1.00 [-] • Barometric pressure > 73.00 kPa • Catalyst heating active • Engine start temperature 5 - 45° C • Time after engine start > 2.0 s • Vehicle speed 0 km/h • And • Diff. air mass setpoint vs. filtered air mass setpoint for load dynamic detection not calibrated [mg/stk] • For time not calibrated [s] • And • Diff. engine speed vs. filtered engine speed for engine speed dynamic detection not calibrated [rpm] • For time not calibrated [s]	• 6.0 s • Once / DCY	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 . – Check for any engine speed sensor or ignition coil faults and diagnose them first. If no other codes are set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring Variable Valve Timing (VVT) Intake Actuator Rationality Check	• 1.8L Camshaft position deviation > 9.0° CRK • 2.0L Camshaft position deviation > 9.90° CRK	• Modeled oil temperature -40 – 160° C • Engine speed 608 – 6,016 RPM • Camshaft position not calibrated • Camshaft position adjustment active • Catalyst heating active • Camshaft position deviation integrator (actual vs. setpoint position) >= 9.0° CRK*s	• 0.0 (FTP75: 45.0) s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .
P053F Cold Start Fuel Pressure Performance Bank 2	Cold Start Monitoring Fuel System Out Of Range Low	• Deviation between set point and actual fuel pressure > 1,500.2 kPa • For time >= 3.0 s	• General: • Engine speed > 608 RPM • Time after engine start > 3.0 s • Fuel mass set point lower range > 1.99 mg/stk • For time >= 5.0 s	• 5.0 s • Once / DCY	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Cold Start Monitoring Fuel System Out Of Range High	• Deviation between set point and actual fuel pressure < -1,500.2 kPa • For time >= 3.0 s	• Fuel mass set point upper range <= 100.32 – 172.41 mg/stk • Fuel mass set point gradient -1,389.0 – 2.2 mg/stk • For time >= 1.2 s • Additional for catalyst heating: • Catalyst heating active • ECT @ cylinder block > -48° C • Fuel mass set point lower range >= 5.0 mg/stk • For time >= 3.0 s			– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Pressure Regulator Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .
P056E Cold Start Turbocharger/Supercharger Boost Control "A" Performance	Turbocharger (TC) Boost Pressure Control Valve Cold Start Functional Check - Slow Response	• Boost pressure actuator position controller output > 98.0% • Boost pressure actuator position controller output < -98.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Catalyst heating active • Boost pressure control active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .
	Turbocharger (TC) Boost Pressure Control Valve Cold Start Functional Check	• Deviation boost pressure actuator position controller > 16.0 – 100.0%	• Time after engine start >= 4.0 s • ECT > -10° C • AAT > -10° C • Difference between actuator position set point in normal mode and during catalyst heating > 0.0% • Catalyst heating active • Boost pressure control active			– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Sensor -G31- . Refer to ⇒ “3.6.8 Charge Air Pressure Sensor G31 , Checking”, page 863 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P05A0 Active Grille Air Shutter "A" Stuck On	Active Grille Air Shutter Functional Check	• Blocked active grille air shutter detected	• AAT not calibrated ° C	• 0.3 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ "3.6.27 Radiator Shutter Motor V544 , Checking", page 902 .
		• Uncontrolled adjustment detected				
P05A2 Active Grille Air Shutter "A" Control Circuit/ Open	Active Grille Air Shutter Open Circuit	• Signal voltage lower range > 1.92 – 2.21 V • Signal voltage upper range < 2.85 – 3.25 V		• 0.5 s	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ "3.6.27 Radiator Shutter Motor V544 , Checking", page 902 .
P05A3 Active Grille Air Shutter "A" Control Circuit Range/Performance	Active Grille Air Shutter Functional Check	• Internal logic failure detected		• 0.3 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ "3.6.27 Radiator Shutter Motor V544 , Checking", page 902 .
		• initialization failure detected		• 0.0 s • Continuous		
	Active Grille Air Shutter Activity Check	• Active grille air shutter controller feedback signal failed		• 24.0 s • Continuous		
P05A4 Active Grille Air Shutter "A" Control Circuit High	Active Grille Air Shutter Short To Battery Plus	• Power stage temperature > 160.0 – 200.0° C • Or • Signal current > 4.0 – 7.0 A		• 0.5 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ "3.6.27 Radiator Shutter Motor V544 , Checking", page 902 .
P05A5 Active Grille Air Shutter "A" Control Circuit Low	Active Grille Air Shutter Short To Ground	• Signal voltage < 1.92 – 2.21 V	• Recording time of signal voltage > 3.3 s • Active grille air shutter feedback failure not detected	• 0.5 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ "3.6.27 Radiator Shutter Motor V544 , Checking", page 902 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P05C0 Active Grille Air Shutter Module "A" Over Temperature	Active Grille Air Shutter Functional Check	• Internal overvoltage detected • Internal overtemperature detected		• 0.3 s • Continuous	• 2 DCY	– Check the Radiator Shutter Motor - V544- . Refer to ⇒ “3.6.27 Radiator Shutter Motor V544 , Checking”, page 902 .
P0601 Internal Control Module Memory Check sum Error	Engine Control Module (ECM): Checksum Verification	• Calibration checksum incorrect		• 1.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		• Software checksum incorrect				
P0603 Internal Control Module Keep Alive Memory (KAM) Error	Engine Control Module (ECM): Communication Check	• Device 1: • SPI communication with ATIC failure		• 2.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
		• Device 2: • SPI communication with ATIC failure				
		• SPI communication with ATIC failure			• 1 DCY	
	Engine Control Module (ECM): Fuel Injection Valves Internal Hardware Check	• Hardware vs. software version check during initialization failure		• 4.9 s • Once / DCY	• 2 DCY	
		• Calibration during initialization failure				
		• Hardware during initialization failure				
		• Time reference from microcontroller during initialization missing		• 1.8L 4,320.0° CRK • 2.0L 2,880.0° CRK		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
				• Continuous		
		• Time reference from microcontroller during initialization failure		• 4.9 s • Once / DCY		
		• Communication between microcontroller and SDI-Driver powerstage failure		• 1.8L 4,320.0° CRK • 2.0L 2,880.0° CRK • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0606 Control Module Processor	Barometric Pressure (BARO) Sensor Engine Standing: Cross Check	• Case 1: charged engine • Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa • Case 2: non charged engine • Diff. BARO mean value vs. MAP mean value not calibrated kPa • Diff. deviation BARO mean value to mean value (MAP mean value, BARO mean value BARO @ ECM keep alive time and MAP @ ECM keep alive time) not calibrated kPa • Diff. deviation MAP mean value to mean value (MAP mean value, BARO mean value, BARO @ ECM keep alive time and MAP @ ECM keep alive time) not calibrated kPa	• Case A: engine stop during DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle not calibrated • For time >= 10.0 s • Case B: engine stop @ start of DCY • Engine stopped • Vehicle speed < 1 km/h • Engine @ driving cycle not calibrated	• 3.0 s • Continuous	• 2 DCY	– Replace the Engine Control Module -J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Barometric Pressure (BARO) Sensor ECM Keep Alive-Time: Cross Check	• Diff. BARO vs. MAP > 7.50 kPa • Diff. BARO vs. turbocharger boost pressure > 7.50 kPa	• Engine stopped • Vehicle speed < 1 km/h • ECM keep alive-time 10.0 – 6,553.5 s • Time after engine stop >= 5.0 s • BARO sensor voltage 0.20 – 4.80 V • MAP sensor voltage 0.20 – 4.80 V • Boost pressure sensor voltage 0.20 – 4.80 V			
	Barometric Pressure Sensor Out Of Range Low	• Measured barometric pressure < 45.0 kPa		• 5.0 s • Continuous		
	Barometric Pressure Sensor Out OF Range High	• Measured barometric pressure > 115.0 kPa				
	Knock Control Internal Hardware Check	• Knock control malfunction: signal acquisition error	• Engine running	• 6.4 s • Continuous		
	Engine Control Module (ECM): EEPROM Check	• EEPROM information failure		• 1.0 s • Continuous		
		• Decryption of NVMCrypt failed		• 1.0 s • Once / DCY		
		• Finished NVMCrypt integrity error				
		• Communication between sample software and production hardware error				
	Engine Control Module (ECM): RAM Internal Hardware Check	• RAM error detected	• Microcontroller failure • Reset counter > 1.0 [-]	• 0.04 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	ECM: Random Access Memory (RAM) Functional Check	• Monitoring module check failed		• 0.5 s • Continuous		
	Engine Control Module (ECM): Analog / Digital Converter Function Monitoring: A/D Converter	• Diff. A/D-channel 1 vs. A/D channel 2 > 0.30 V		• 0.5 s • Continuous		
	Engine Control Module (ECM): Communication Check	• SPI communication with ATIC failed	• Time after ignition on >= 1.0 s	• 10.0 s • Continuous		
		• SPI communication with ATIC implausible				
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Torque	• Monitoring of difference between actual and set point torque value • Engine torque overflow > 45.0 – 350.0 Nm	• Throttle actuator commanded on	• 0.5 s • Continuous		
		• Monitoring of torque difference integration • Integrated engine torque > 550.0 Nm		• 0.01 s • Continuous		
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: Engine Speed Limitation	• Engine speed > 1,760 RPM	• Engine speed limitation active • Injection active	• 0.5 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Control Module (ECM): Electronic Throttle Control Module Function Monitoring: A/D Converter	• Internal check failed		• 0.5 s • Continuous		
P0607 Control Module Performance	Barometric Pressure (BARO) Sensor Short To Ground	• Barometric pressure sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Replace the Engine Control Module - J623- . Refer to appropriate repair manual.
	Barometric Pressure (BARO) Sensor Short To Battery Plus	• Barometric pressure sensor voltage > 4.80 V				
P0634 Control Module Internal Temperature "A" Too High	Turbocharger (TC) Boost Pressure Control Over Temperature	• Bypass valve driver temperature (hardware values) > 170 – 190° C	• Control valve commanded on	• 0.4 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Adaptation Value Monitoring	• Battery voltage <= 9.04 V	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) active	• 0.01 s • Once per lifetime	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
	Throttle Actuator Adaptation Value Monitoring	• Actual TPS 1 or 2 voltage - voltage ref. point > 0.07 V • Actual TPS - ref. point > 0.503° TPS	• Throttle adaptation demanded • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 120° C	• 0.01 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Throttle Actuator monitoring of position	• Actual TPS - ref. point > 0.503° TPS	• Throttle adaptation demanded • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 120° C			
		• Actual TPS 1 or 2 voltage - voltage ref. point > 0.07 V				
	Throttle Actuator monitoring of position	• Actual TPS 1 or 2 voltage - voltage ref. point > 0.25 V				
	Throttle Actuator Adaptation Value Monitoring	• Accelerator pedal value > 99.9% • Engine speed > 64 RPM • Vehicle speed > 2 km/h • IAT @ throttle < 5° C • ECT @ cylinder block < 5° C • ECT @ cylinder block > 120° C	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) active	• 0.01 s • Once per lifetime		
	Throttle Actuator Adaptation Value Monitoring	• Actual TPS - ref. point > 0.503° TPS	• Throttle adaptation demanded • Accelerator pedal value < 99.9% • Engine speed < 64 RPM • Vehicle speed < 2 km/h • IAT > 5° C • ECT 5 – 120° C			
P0642 Sensor Reference Voltage "A" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 1 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0643 Sensor Reference Voltage "A" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 1 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0652 Sensor Reference Voltage "B" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 2 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0653 Sensor Reference Voltage "B" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 2 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0657 Actuator Supply Voltage "A" Circuit/ Open	Engine Components Supply Voltage Relay Open Circuit	• Output voltage lower range >= 1.90 – 2.30 V • Output voltage upper range (hardware values) <= 2.80 – 3.20 V	• Actuator commanded off	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0658 Engine Actuator Supply Voltage "A" Circuit Low	Engine Components Supply Voltage Relay Short To Ground	• Output voltage (hardware values) < 1.90 – 2.30 V	• Actuator commanded off	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0659 Engine Actuator Supply Voltage "A" Circuit High	Engine Components Supply Voltage Relay Short To Battery Plus	• Output current > 1.0 – 2.3 A • Actuator temperature (hardware values) > 175 – 195° C	• Actuator commanded on	• 1.0 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
P0686 ECM/ PCM Power Relay Control Circuit Low	Main Relay Rationality Check During Engine Off	• Sensed circuit voltage > 6.0 V	• Main relay commanded off • For time >= 0.3 s	• 0.1 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
	Main Relay Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Relay commanded off • For time > 40.0 ms	• 0.2 s • Continuous		
P0687 ECM/ PCM Power Relay Control Circuit High	Main Relay Rationality Check During Engine Running	• Sensed circuit voltage < 5.0 V	• Main relay commanded on • For time >= 0.1 s	• 0.1 s • Continuous	• 2 DCY	– Check the Motronic Engine Control Module Power Supply Relay - J271- . Refer to ⇒ “3.6.23 Motronic Engine Control Module Power Supply Relay J271 , Checking”, page 892 .
	Main Relay Short To Battery Plus	• Main relay driver temperature > 175 – 195° C • Or • Main relay output current > 1.0 – 2.3 A	• Main relay commanded on • For time >= 0.4 s	• 0.2 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P0698 Sensor Reference Voltage "C" Circuit Low	Engine Control Module (ECM): 5V Supply Voltage Out Of Range Low	• Analog output 3 supply voltage < 4.62 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P0699 Sensor Reference Voltage "C" Circuit High	Engine Control Module (ECM): 5V Supply Voltage Out Of Range High	• Analog output 3 supply voltage > 5.43 V		• 0.2 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A1 Fuel Rail Pressure Sensor Inappropriately Low	Fuel Rail Pressure (FRP) Sensor Rationality Check Low	• Deviation lambda of controller included adaptation < -45.0% • High pressure controller output > 8 mg	• General: • Engine speed > 608 – 1,088 RPM • Fuel mass set point 1.99 – 20.01 mg/stk • Time after change to DFI not equipped s • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated. • Lambda control closed loop • Evap purge functionality diagnosis not active • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/stk • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/stk • Fuel mass set point gradient -1,389.0 – 2.20 mg/stk • For time >= 1.2 s • Depending on canister purge: • Canister load <= 0.7 [-] • Evap purge valve not active or closed	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor - G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P12A2 Fuel Rail Pressure Sensor Inappropriately High	Fuel Rail Pressure (FRP) Sensor Rationality Check High	• Deviation lambda of controller included adaptation > 30.0% • High pressure controller output < -10 mg	• General: • Engine speed > 608 – 1,088 RPM • Fuel mass set point 4.01 – 29.99 mg/stk • Time after change to DFI not equipped s • Time after engine start > 5.0 s • Engine warm-up not calibrated • Catalyst heating not calibrated • Full load not calibrated • Catalyst purge not calibrated • Lambda control closed loop • Evap purge functionality diagnosis not active • Depending on low dynamic conditions: • Fuel mass set point lower range > 1.99 mg/stk • For time >= 5.0 s • Fuel mass set point upper range < 100.32 – 172.41 mg/stk • Fuel mass set point gradient -1,389.0 – 2.20 mg/stk • For time >= 1.2 s • Depending on canister purge: • Canister load <= 0.7 [-] • Evap purge valve not active or closed	• 10.0 s • Continuous	• 2 DCY	– Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P13EA Cold Start Ignition Timing Performance Off Idle	Ignition Control (IC) Ignition Timing Monitor @ Part Load	• Ratio between ignition angle efficiency integral and time at part load > 0.12 [-]	• Engine part load • Ignition angle efficiency setpoint<= 0.88 [-] % • Vehicle speed > 2 km/h • Barometric pressure > 73.00 kPa • Catalyst heating active • Engine start temperature 5 – 45° C • Time after engine start > 2.0 s • Diff. air mass setpoint vs. filtered air mass setpoint for load dynamic detection not calibrated [mg/stk] • For time not calibrated [s] • Diff. engine speed vs. filtered engine speed for engine speed dynamic detection not calibrated [rpm] • For time not calibrated [s]	• 1.8L 5.0 s • 2.0L 6.0 s • Once / DCY	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine Control Module - J623- . Refer to appropriate repair manual.
P1545 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Out Of Range	• Control duty cycle > 98.0%	• Throttle position not at min. value • Throttle adaptation not active • Throttle actuator commanded on	• 0.7 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
	Throttle Actuator Rationality Check	• Difference between throttle position set point and throttle flap opening angle for electronic throttle control > 2.998 – 24.982° TPS	• Throttle adaptation (@ initial start or after detection of throttle exchange or checksum error) not active • Throttle actuator commanded on • Diff. throttle position set point vs. throttle flap opening angle <= 1.999; > -1.999° TPS	• 0.5 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P1609 Crash Shut-Off Was Triggered	Airbag Safety Measures Due To Crash With Airbag Activation	• Airbag(s) activated		• 0.0 s • Continuous	• 2 DCY	– After proper repair of damage, erase the Engine Control Module -J623- DTC. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 .
P169A Loading Mode Active	Engine Control Module (ECM): Transport Mode Function Monitoring: Mode Change	• Transport mode active	• Vehicle speed < 5 km/h • Max trip mileage since initial vehicle start-up < 100.0 km • During ECM keep alive-time after ignition off • Engine speed 0 RPM • Production mode not active • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY	– Vehicle is in Transport Mode (Loading Mode). It can be turned off with a scan tool or will automatically switch off after approximately 100 km (62.15 miles) have accumulated on the vehicle. May need to perform readiness check. Refer to ⇒ “3.2 Readiness Code”, page 14 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2004 Intake Manifold Runner Control Stuck Open Bank 1	Intake Manifold Runner Control (IMRC) Actuator Stuck Open	• Signal voltage > 1.89 V • For time >= 1.5 s	• Flap commanded off • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ "3.6.19 Intake Manifold Runner Position Sensor G336 , Checking", page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ "3.6.18 Intake Manifold Runner Control Valve N316 , Checking", page 883 .
P2006 Intake Manifold Runner Control Stuck Closed Bank 1	Intake Manifold Runner Control (IMRC) Actuator Stuck Close	• Signal voltage < 3.10 V • For time >= 1.5 s	• Flap commanded on • Time after engine start > 5.0 s	• 0.2 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ "3.6.19 Intake Manifold Runner Position Sensor G336 , Checking", page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ "3.6.18 Intake Manifold Runner Control Valve N316 , Checking", page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2008 Intake Manifold Runner Control Circuit/ Open Bank 1	Intake Manifold Runner Control (IMRC) Actuator Open Circuit	• Output voltage lower range >= 1.92 – 2.21 V • Output voltage upper range (hardware values) <= 2.85 – 3.25 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2009 Intake Manifold Runner Control Circuit Low Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Ground	• Output voltage (hardware values < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2010 Intake Manifold Runner Control Circuit High Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Battery Plus	• Power stage temperature > 160 – 200° C • Or • Output current > 4.0 – 7.0 A	• Engine running • Actuator commanded on	• 2.0 s • Continuous •	• 2 DCY	– Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 . – Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 .
P2014 Intake Manifold Runner Position Sensor/Switch Circuit Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Ground / Open Circuit	• Intake manifold runner flap position sensor voltage < 0.20 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor - G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve - N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2017 Intake Manifold Runner Position Sensor/Switch Circuit High Bank 1	Intake Manifold Runner Control (IMRC) Actuator Short To Battery Plus	• Intake manifold runner flap position sensor voltage > 4.80 V	• Engine start not active	• 0.04 s • Continuous	• 2 DCY	– Check the Intake Manifold Runner Position Sensor -G336- . Refer to ⇒ “3.6.19 Intake Manifold Runner Position Sensor G336 , Checking”, page 885 . – Check the Intake Manifold Runner Control Valve -N316- . Refer to ⇒ “3.6.18 Intake Manifold Runner Control Valve N316 , Checking”, page 883 .
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Ground	• Output voltage (hardware values) < 1.92 – 2.21 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40- . Refer to ⇒ “3.6.4 Camshaft Position Sensor G40 , Checking”, page 855 . – Check the Camshaft Adjustment Valve 1 -N205- . Refer to ⇒ “3.6.3 Camshaft Adjustment Valve 1 N205 , Checking”, page 853 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	Variable Valve Timing (VVT) Intake Actuator Short To Battery Plus	• Power stage temperature > 160 – 200° C • Output current > 8.0 – 12.0 A	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40- . Refer to ⇒ "3.6.4 Camshaft Position Sensor G40 , Checking", page 855 . – Check the Camshaft Adjustment Valve 1 - N205- . Refer to ⇒ "3.6.3 Camshaft Adjustment Valve 1 N205 , Checking", page 853 .
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range Low	• adaptation value < -0.05 [-]	• 2nd lambda control n.a. • Catalyst purge not active • Injection mode change (DFI/MFI) not active • Engine speed >= 704 RPM • Counter of integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range High	• adaptation value > 0.05 [-]	• 2nd lambda control n.a. • Catalyst purge not active • Injection mode change (DFI/MFI) not active • Engine speed >= 704 RPM • Counter of integrated mass for fuel in oil < 255.0 [-] • Choice of: • O2S rear (binary) check not active • O2S rear (binary) check finished	• 81.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ "3.1 Preliminary Check", page 13 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .
P2100 Throttle Actuator "A" Control Motor Circuit/Open	Throttle Actuator Open Circuit	• Electronic throttle valve driver load resistance > 200.0 kΩ	• Difference between measured and filtered throttle position <= 119.50° TPS Throttle actuator commanded off	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Over Temperature	• Electronic throttle valve driver temperature (hardware values) > 170.0 – 190.0° C	• Throttle actuator commanded on	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3- . Refer to ⇒ "3.6.33 Throttle Valve Control Module GX3 , Checking", page 915 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2103 Throttle Actuator "A" Control Motor Circuit High	Throttle Actuator Short Circuit	• Electronic throttle valve driver current > 9.3 – 15.0 A	• Throttle actuator commanded on	• 0.1 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module GX3 , Checking”, page 915 .
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Pedal Position (APP) Sensor 1 Out Of Range Low	• Signal voltage sensor 1 < 0.39 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Pedal Position (APP) Sensor 1 Out Of Range High	• Signal voltage sensor 1 > 4.86 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Pedal Position (APP) Sensor 2 Out Of Range Low	• Signal voltage sensor 2 < 0.19 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Pedal Position (APP) Sensor 2 Out Of Range High	• Signal voltage sensor 2 > 2.80 V		• 0.3 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Pedal Position (APP) Sensor 1 and 2 Rationality Check	• Difference between signal voltage sensor 1 and sensor 2 > 0.10 – 0.12 V		• 0.4 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module - GX2- . Refer to ⇒ “3.6.1 Accelerator Pedal Module GX2 , Checking”, page 848 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Direct Fuel Injection System Too Lean @ Part Load	• Adaptive value >= 28.0%	• Air mass > 60.0 mg/stk • 1.8L ECT @ cylinder block > 55° C • 2.0L ECT @ cylinder block > 60° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Fuel mass 17.99 – 51.02 mg/stk • Engine speed 1,280 – 4,000 RPM • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/stk • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value	• 5.0 s • Continuous .	• 2 DCY	– Check vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 ,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dependence on canister purge min: • Lower limit of lambda controller output n.a. • Upper limit of lambda controller output n.a. • Evap purge flow at min. value			Testing", page 873 . – Check the Intake Manifold Sensor -GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9, Checking", page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Direct Fuel Injection System Too Rich @ Part Load	• Adaptive value <= -25.0%	• Air mass > 60.0 mg/stk • 1.8L ECT @ cylinder block > 55° C • 2.0L ECT @ cylinder block > 60° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Fuel mass 17.99 – 51.02 mg/stk • Engine speed 1,280 – 4,000 RPM • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/stk • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value	• 5.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Dependence on canister purge min: • Lower limit of lambda controller output not calibrated • Upper limit of lambda controller output not calibrated • Evap purge flow at min. value			GX9 , Checking", page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ "3.6.15 Fuel Pressure Regulator Valve N276 , Checking", page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Engine Cooling System Cooling System Performance Not In The Expected Range	• Case 1: • Cooling system temperature too low after a sufficient mass air flow (indication by a mass air flow based temperature model) < 66 – 76° C • Or • Case 2: • Filtered ECT decreases under a threshold value after reaching a high temperature level < 61° C • For time not calibrated [s]	• Case 1: • ECT @ first start (lower threshold) >= -10° C • ECT @ first start (upper threshold) <= 47 – 57° C • AAT > -10° C • Start of fault decision: • Modeled ECT > 66 – 76° C • Conditions at fault decision: • Accum. fuel cut off time since first engine start <= 10.20 % • Accum. start-stop time since first engine start <= 16.00 % • Accum. minimum load and maximum load time since first engine start <= 39.80 % • For relative MAF > 40.00 % • Or • Relative MAF <= 2.50 % • Accum. Maximum vehicle speed time since first engine start <= 14.80 % • For vehicle speed > 120 km/h • Case 2: • ECT exeeds a threshold value > 65° C • AAT > -10° C • ECT @ first start (lower threshold) >= -40° C • ECT@ first start (upper threshold) <= 215° C	• 0.0 (Unified 430.0) s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 . – Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . Check the After-Run Coolant Pump - V51- . Refer to ⇒ “3.6.2 After-Run Coolant Pump V51 , Checking”, page 851 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Conditions for time: relative MAF > 5.00 % • Vehicle speed not calibrated km/h • Modeled ECT > 65° C • Engine stop counter < 255.00 [-] • For time >= 15.0 s			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2183 Engine Coolant Temperature Sensor 2 Circuit Range/Performance	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Cross Check	• High side: reference measuring • Diff. ECT @ radiator outlet @ cold start vs. IAT @ manifold @ cold start > 20.0 K • Diff. ECT @ radiator outlet @ cold start vs. ECT @ cylinder block @cold start not calibrated [K] • Diff. ECT @ radiator outlet @ cold start vs. AAT @ cold start > 20.0 K • Min. amount of faulty reference measurements to detect defective sensor 2.00 [-] • Or • Low side: reference measuring • Diff. IAT @ manifold @ cold start vs. ECT @ radiator outlet @ cold start > 20.0 K • Diff. ECT @ cylinder block @ cold start vs. ECT @ radiator outlet @cold start not calibrated [K] • Diff. AAT @ cold start vs. ECT @ radiator outlet @ cold start > 20.0 K	• Engine off time >= 360.00 min • Engine off time plausible • Time after engine start <= 6553.5 s • Depending on temperature slope @ cold start: • Diff. actual IAT @ manifold vs. IAT @ manifold @ start of DCY < 256.0 K • Diff. actual ECT @ cylinder block vs. ECT @ cylinder block @ start of DCY not calibrated [K] • Diff. actual ECT @ radiator outlet vs. ECT @ radiator outlet @ start of DCY < 256.0 K • Diff. actual AAT vs. AAT @ start of DCY < 256.0 K • For time >= 0.1 s • Depending on mean value condition • Mean value of all temperature sensors @ cold start >= -256° C • Number of valid sensors >= 2.00 [-] • Depending on block heater / solar radiation detection • Time after engine start >= 0.5 s • Vehicle speed >= 20 km/h • For time >= 20.0 s • Diff. actual IAT @ manifold vs. min. IAT @ manifold < 4.5 K	• 0.1 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Min. amount of faulty reference measurements to detect defective sensor 2.00 [-]	• Diff. actual ECT @ cylinder block vs. min. ECT @ cylinder block not calibrated [K] • Diff. actual AAT vs. min. AAT < 4.5 K • Diff. actual ECT @ radiator outlet vs. min. ECT @ radiator outlet < 4.5 K			
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Short To Ground	• Sensor voltage <= 0.30 V		• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Engine Coolant Temperature (ECT) Sensor @ Radiator Outlet Short To Battery / Open Circuit	• Sensor voltage > 4.90 V	• IAT @ throttle >= -33° C • Time after engine start > 60.0 s	• 0.5 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to ⇒ “3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet G83 , Checking”, page 867 . – Check the Engine Coolant Temperature Sensor - G62- . Refer to ⇒ “3.6.9 Engine Coolant Temperature Sensor G62 , Checking”, page 865 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Direct Fuel Injection System Too Lean @ Idle	• Case 1: • Adaptive value >= 2.40 mg/stk • Case 2: • Adaptive value not calibrated kg/h	• Air mass > 60.0 mg/stk • ECT @ cylinder block > 55° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/stk • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Fuel mass upper range < 0.0 – 17.0 mg/stk • Fuel mass lower range not calibrated mg/stk • Engine speed 704 – 992 RPM • Engine not calibrated • Evap purge valve closed	• 5.0 s • Continuous	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Pressure Sensor -G247- . Refer to ⇒ “3.6.16 Fuel Pressure Sensor G247 , Checking”, page 879 . – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output not calibrated • Upper limit of lambda controller output not calibrated • Evap purge flow at min. value			– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve - N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Direct Fuel Injection System Too Rich @ Idle	• Case 1: • Adaptive value <= -2.40 mg/stk • Case 2: • Adaptive value n.a. kg/h	• Air mass > 60.0 mg/stk • 1.8L ECT @ cylinder block > 55° C • 2.0L ECT @ cylinder block > 60° C • IAT @ manifold > -48° C • AAT > -48° C • Lambda set point 0.92 – 1.05 [-] • Lambda control closed loop • Integrated air mass >= 5.0 – 200.0 g • Vehicle speed < 6 km/h • Low dynamic conditions: • Diff. engine speed vs. averaged engine speed for engine speed dynamic detection < 100 – 175 RPM • Diff. air mass vs. averaged air mass for load dynamic detection < 30.01 – 60.0 mg/stk • Diff. between reference and actual fuel pressure, high side not calibrated kPa • Integrated air mass > 5.0 g • Fuel mass upper range < 0.0 – 17.0 mg/stk • Fuel mass lower range not calibrated mg/stk • Engine speed 704 – 992 RPM • Engine n.a.	• 5.0 s • Continuous	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Evap purge valve closed • Canister load <= 1.20 [-] • Evap purge flow at max. value • Depending on canister purge min: • Lower limit of lambda controller output not calibrated • Upper limit of lambda controller output not calibrated • Evap purge flow at min. value			GX9 , Checking”, page 887 . – Check the Fuel Pressure Regulating Valve -N276- . Refer to ⇒ “3.6.15 Fuel Pressure Regulator Valve N276 , Checking”, page 877 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ “3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking”, page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check - Upstream And Downstream Oxygen Sensor Signal	• Lambda value > 1.15 [-] • O2S signal rear >= 0.88 V	• O2S front ready • O2S rear ready • ECT >= -48° C • Limited dynamic conditions active • Mass air flow > 15.0; < 300.0 kg/h • Catalyst purge not active • Engine speed > 1,152 RPM • Exhaust gas temperature at O2S rear > -273; < 800° C • Combustion mode change not active	• 72.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check - Upstream And Downstream Oxygen Sensor Signal	• Lambda value < 0.85 [-] • And • O2S rear voltage <= 0.25 V	• O2S front ready • O2S rear ready • ECT >= -48° C • Limited dynamic conditions active • Mass air flow > 15.0; < 300.0 kg/h • Catalyst purge not active • Engine speed > 1,152 RPM • Exhaust gas temperature at O2S rear > -273; < 800° C • Combustion mode not active	• 72.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ "3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking", page 899 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 . – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ "3.6.20 Intake Manifold Sensor GX9 , Checking", page 887 . – Check the EVAP Canister Purge Regulator Valve 1 - N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219C Cylinder 1 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • adaptation value unweighted < -13.0% • Cylinder 2: • adaptation value unweighted < -13.0% • Cylinder 3: • adaptation value unweighted < -13.0% • Cylinder 4: • adaptation value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • adaptation value weighted < -10.0% • Cylinder 2: • adaptation value weighted < -10.0% • Cylinder 3: • adaptation value weighted < -10.0% • Cylinder 4: • adaptation value weighted < -10.0%	• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219D Cylinder 2 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • adaptation value unweighted < -13.0% • Cylinder 2: • adaptation value unweighted < -13.0% • Cylinder 3: • adaptation value unweighted < -13.0% • Cylinder 4: • adaptation value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1,440 – 3,008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • adaptation value weighted < -10.0% • Cylinder 2: • adaptation value weighted < -10.0% • Cylinder 3: • adaptation value weighted < -10.0% • Cylinder 4: • adaptation value weighted < -10.0%	• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219E Cylinder 3 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • adaptation value unweighted < -13.0% • Cylinder 2: • adaptation value unweighted < -13.0% • Cylinder 3: • adaptation value unweighted < -13.0% • Cylinder 4: • adaptation value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • adaptation value weighted < -10.0% • Cylinder 2: • adaptation value weighted < -10.0% • Cylinder 3: • adaptation value weighted < -10.0% • Cylinder 4: • adaptation value weighted < -10.0%	• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P219F Cylinder 4 Air-Fuel Ratio Imbalance	Fuel System Predicted Adaptation Out Of Range Low	• Cylinder 1: • adaptation value unweighted < -13.0% • Cylinder 2: • adaptation value unweighted < -13.0% • Cylinder 3: • adaptation value unweighted < -13.0% • Cylinder 4: • adaptation value unweighted < -13.0%	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the spark plugs visually for signs of fouling. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ “3.1 Preliminary Check”, page 13 and/or to appropriate repair manual. – Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Cylinder 1: • adaptation value weighted < -10.0% • Cylinder 2: • adaptation value weighted < -10.0% • Cylinder 3: • adaptation value weighted < -10.0% • Cylinder 4: • adaptation value weighted < -10.0%	• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0% • Dynamic ignition angle < 0.10 [-] • Additional conditions • Misfire on currently lean shifted cylinder not detected			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Pump Voltage (VIP)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • And • Choice of: • Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 11.5 mA • Or • Measurement O2S front label resistor not calibrated Ω	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Nernst Voltage (VN)	• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • And • Choice of: • Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 11.5 mA • Measurement O2S front label resistor not calibrated Ω	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Open Circuit Virtual Ground (VG)	• Nernst voltage (VN) > 4.40 V • Or • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 2.35 V • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) < -2.35 V • Or • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.60 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) < -0.10 V • Or • Pump current > 11.5 mA • Or • Measurement O2S front label resistor not calibrated Ω • And • Choice of: • Diff. pump voltage (VIP) vs. virtual ground voltage (VG) <= 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) <= 1.20 V • Or	• O2S front (linear) ready • O2S ceramic temperature > 785° C • For time >= 10.0 s	• 2.3 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diff. pump voltage (VIP) vs. virtual ground voltage (VG) > 1.20 V • Diff. nernst voltage (VN) vs. virtual ground voltage (VG) > 1.20 V				
P2257 AIR System Control "A" Circuit Low	Secondary Air Injection (AIR) Pump Relay Short To Ground	• Output voltage < 1.92 – 2.21 V	• Engine running • Actuator commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 .
P2258 AIR System Control "A" Circuit High	Secondary Air Injection (AIR) Pump Relay Short To Battery Plus	• Actuator temperature > 160 – 200° C • Or • Output current > 1.0 – 2.0 A	• Engine running • Actuator commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ "3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking", page 904 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2261 Turbocharger/Supercharger Bypass Valve "A" - Mechanical	Turbocharger Bypass (TCBY) Functional Check: Stuck Close	• Case 1: • Integrated boost pressure deviation between PUT and filtered PUT n.a. kPa*s • Case 2: • Counter PUT crosses filtered PUT > 5.0 [-] • Operational sequence for incrementing counter in case 2: • 1.8L Positive difference between PUT and filtered PUT > 0.80 kPa • 2.0L Positive difference between PUT and filtered PUT > 0.41 kPa • After • Negative difference between PUT and filtered PUT (first count: only positive difference) < -2.0 kPa	• External torque request not demanded • IAT @ throttle > -11° C • Barometric pressure > 73.0 kPa • Intake overpressure protection not active • Active turbocharger protection leading to opening of the waste gate not active • Activations conditions: • Recirculation actuator position set point 100.0% • Time since last valve closed activation > 1,200 ms • Gradient accelerator pedal value <= -97.70%/s • Max boost pressure variation <= 50.0 kPa	• 0.1 s • Continuous	• 2 DCY	– Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator - V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2263 Turbocharger/Supercharger Boost System Performance	Turbocharger (TC) Position Sensor First adaptation Monitoring: Functional Check	• No adaptation of boost pressure sensor in actual driving cycle (no previous adaptation occurred)	• Time after engine start > 0.3 s • Pressure upstream throttle 0.00 – 543.40 kPa • AAT >= -48° C • ECT -40 – 120° C	• 0.0 s • Once / DCY	• 2 DCY	– Check the Turbocharger Recirculation Valve -N249- . Refer to ⇒ “3.6.34 Turbocharger Recirculation Valve N249 , Checking”, page 918 . – Check the Charge Air Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Range Check	• Case 1: • Max. O2S rear voltage < 0.87 V • And • Oxygen load during peak max detection > 4.0 g • Or • Case 2: • Max. O2S rear voltage < 0.87 V • And • Oxygen load during peak max detection > 3.8 g • And • Counter in case of suspected Peak Max error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of secondary fuel control loop < 0.25 [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Temperature conditions: • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT @ O2S front <= 1,201° C • Air mass conditions • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk • Air mass during diagnosis not calibrated mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output <= 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: Case 1 • Evap purge valve not calibrated • Case 2: • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3: • Canister load not calibrated [-] • Evap purge flow not calibrated • Close the gap conditions			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors (O2S) Rear Signal Range Check	• Case 1: • Min. O2S rear voltage > 0.25 V • And • Oxygen load during peak min detection > 2.6 g • Or • Case 2: • Min. O2S rear voltage > 0.25 V • And • Oxygen load during peak min detection > 2.5 g • And • Counter in case of suspected peak min error > 5,000.0 [-]	• General conditions • Vehicle speed >= 10 km/h • BARO not calibrated kPa • Catalyst overheating protection not active • Turbine overheating protection not active • O2S rear ready • O2S heater rear active • O2S front ready • Internal resistance O2S rear <= 700.0 Ω • Time after a catalyst purge phase >= 0.02 s • Integrated heat energy >= 1,600.0 – 3,000.0 kJ • Time after engine start > 230.0 – 1,000.0 s • 1.8L Engine speed 1,280 – 3,008 RPM • 2.0L Engine speed 1,344 – 3,008 RPM • Lambda control value < 50.0% • Deviation of lambda controller output @ start diagnosis < 10.0% • Deviation of lambda controller output during diagnosis < 8.0 – 15.0% • Fast trim control not calibrated • Proportional part of trim control < 0.25 [-]	• 86.5 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ "3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking", page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Coasting function not active • Lambda adaptation not active • Valve lift not equipped • Temperature conditions • ~~ Signal (tmot) > 60° C • ~~ Signal (tans) > -48° C • Modeled catalyst temperature once after engine start > 550° C • Modeled catalyst temperature @ start of diagnosis 500 – 700° C • Modeled catalyst temperature during diagnosis 470 – 730° C • Integrated air mass, catalyst temp. conditions fulfilled not calibrated g • Diff. between dynamic and stationary catalyst temperature @ start of diagnosis -254.0 – 254.0 K • Diff. between dynamic and stationary catalyst temperature during diagnosis -304.0 – 304.0 K • Modeled EGT at O2S rear <= 1,201° C • Air mass conditions • Air mass @ start of diagnosis 125.01 – 580.0 mg/stk • Air mass during diagnosis not calibrated mg/stk			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• MAF per cylinder @ start of diagnosis 40.0 – 130.0 kg/h • MAF per cylinder during diagnosis 35.0 – 135.0 kg/h • Load conditions: • Air mass set point 125.01 – 580.0 mg/stk • Engine load not calibrated % • Accelerator pedal value not calibrated % • For time not calibrated s • Low dynamic conditions • Dynamic engine speed < 20 RPM • Dynamic air mass < 25.01 mg/stk • Dynamic lambda controller output < 20.0% • Integrated air mass after dynamic conditions are fulfilled > 20.0 g • Evap purge conditions: • Case 1 • Evap purge valve not calibrated • Case 2 • Canister load calculation not calibrated • Evap purge flow not calibrated • Case 3 • Canister load not calibrated [-] • Evap purge flow not calibrated			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Close the gap conditions • O2S rear voltage @ diagnosis start >= 0.55 V • Integrated air mass @ start diagnosis not calibrated g • O2S front dynamic diagnosis separate not active			
P2279 Intake Air System Leak	Intake Air (IA) System Rationality Check	• Ratio adapted turbocharger boost pressure and actual turbocharger boost pressure > 35.0% • Lambda correction included controller and adaptation -50.0 – 50.0% • Lambda controller active	• Intake manifold modeled adaptation active (by turbocharger boost pressure) • Throttle position > 4.50° TPS • Engine speed 1,216 – 6,000 RPM • Pressure quotient @ throttle 0.63 – 0.90 [-] • Engine running • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Boost pressure < 135.0 kPa • BARO 73.0 – 107.5 kPa	• 5.0 s • Continuous	• 2 DCY	– Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor - GX9- . Refer to ⇒ “3.6.20 Intake Manifold Sensor GX9 , Checking”, page 887 . – Check the Throttle Valve Control Module - GX3- . Refer to ⇒ “3.6.33 Throttle Valve Control Module

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Throttle opening area correction included controller and adaptation > 50.0% • Lambda correction included controller and adaptation -28.0 – 28.0% • Lambda controller active	• Intake manifold modeled adaptation active (by throttle opening area) • Throttle position 0.000 – 100.003° TPS • Engine speed 576 – 3,008 RPM • Pressure quotient @ throttle 0.27 – 0.60 [-] • Fast throttle adaptation finished • MAP gradient -200.0 – 200.0 kPa/s • Fuel cut off not active • Time after engine start > 5.0 s • Turbo charger boost pressure < 135.0 kPa • BARO 73.0 – 107.5 kPa			GX3 , Checking", page 915 . – Check the EVAP Canister Purge Regulator Valve 1 -N80- . Refer to ⇒ "3.6.12 EVAP Canister Purge Regulator Valve 1 N80 , Checking", page 871 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state > 50 – 100 mA	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_inactive_low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ "3.6.17 Ignition Coils With Power Output Stage , Checking", page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diagnosis_by_machine_low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state 100...180 mA	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2302 Ignition Coil "A" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state > 50 – 100 mA	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_machine_low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Diagnosis_by_machine_low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state 100...180 mA	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2305 Ignition Coil "B" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state > 50 – 100 mA	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_inactive high side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
		• Diagnosis_by_active high side switch in ATIC • Output temperature from ATIC in on state > 180.0 – 200.0° C • Output current in on state 100...180 mA	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2308 Ignition Coil "C" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Output current in on state > 50 – 100 mA	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230A Cylinder 1 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230B Cylinder 2 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230C Cylinder 3 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P230D Cylinder 4 Air-Fuel Ratio Imbalance - Adjustment At Limit During Balance	Fuel System Misfire Monitoring Rationality Check	• Cylinder misfire counter > 10.0 [-]	• Modeled catalyst temperature <= 900° C • Lambda set value 0.97 – 1.03 [-] • Catalyst heating not active • Fuel cut off not active • ECT 60 – 143° C • AAT >= -48° C • Barometric pressure not calibrated kPa • Mass fuel flow set point 12.0 – 29.99 mg/stk • Segment adaptation completed • Lambda control closed loop • Catalyst purge not active • Canister load <= 2.0 [-] • No gear shift • For segments 90.0 [-] • Segments after start not calibrated [-] • Time after engine start not calibrated s • Integrated mass air flow >= 0.75 – 7.0 kg • Rough road not detected • 1.8L Engine speed 1,248 – 2,816 RPM • 2.0L Engine speed 1440 – 3008 RPM • Dependence on oxygen sensor diagnosis	• 4 times • Once / DCY	• 2 DCY	– Check the Fuel Injectors . Refer to ⇒ “3.6.14 Fuel Injectors , Checking”, page 875 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7- . Refer to ⇒ “3.6.25 Oxygen Sensor 1 After Catalytic Converter GX7 , Checking”, page 896 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
			• Oxygen sensor dynamic diagnosis finished n.a. • Oxygen sensor delay diagnosis finished n.a. • Diagnosis at gear • 1st gear not active • 2nd gear not active • 3nd gear not active • 4nd gear active • 5nd gear active • 6nd gear active • 7nd gear active • 8nd gear not active • Limited dynamic conditions • Dynamic engine speed < 75 RPM • Dynamic MAF < 29.99 mg/stk • Dynamic torque request < 0.10 [-] • Dynamic window lambda control < 5.0 % • Dynamic ignition angle < 0.10 [-] • Additional conditions • Cylinder balancing diagnosis of all cylinders active			
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Diagnosis_by_machine_low side switch in ATIC • Output voltage in OFF state > 4.95 – 5.285 V (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded off	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
		• Diagnosis_by_machine_low side switch in ATIC • Output temperature from ATIC in on state > 160.0 – 200.0° C • Output current in on state driver stage internal value (hardware values)	• Engine speed > 512 RPM • Engine stop not active • Actuator commanded on			
P2311 Ignition Coil "D" Secondary Circuit	Ignition Coils Open Circuit	• Output voltage in off state lower range >= 1.92 – 2.21 V • Output voltage in off state upper range <= 2.85 – 3.25 V (hardware values)	• Engine speed > 512 RPM • ECT @ cylinder block > -30° C • Engine stop not active	• 0.8 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage . Refer to ⇒ “3.6.17 Ignition Coils With Power Output Stage , Checking”, page 881 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage, lower range 1.92 – 2.21 V • Output voltage, upper range 2.85 – 3.25 V	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2401 EVAP System Leak Detection Pump Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage < 1.92 – 2.21 V (hardware values)	• Actuator commanded off	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P2402 EVAP System Leak Detection Pump Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 160...200° C • Or • Output current > 4.0 – 7.0 A	• Actuator commanded on	• 2.0 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	Evaporative Emission (EVAP) System Signal Check	• Pump current oscillation > 1.5 mA • And • Number of aborted leak measurements due to pump current oscillations > 0.0 [-]	• Time after measurement start > 4.0 s (during ECM keep alive-time)	• 624.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240 A EVAP System Leak Detection Pump Heater Control Circuit/ Open	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Open Circuit	• Output voltage lower range 1.85 – 2.28 V • Output voltage upper range 2.75 – 3.36 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240 B EVAP System Leak Detection Pump Heater Control Circuit Low	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Ground	• Output voltage < 1.85 – 2.28 V (hardware values)	• Actuator commanded off	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .
P240 C EVAP System Leak Detection Pump Heater Control Circuit High	Evaporative Emission (EVAP) Leak Detection Pump (LDP) Short To Battery Plus	• Actuator temperature > 155 – 185° C • Or • Output current > 4.0 – 7.0 A	• Actuator commanded on	• 0.3 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors (O2S) Front Rationality Check	• Pump current correction > 1.2 mA (nernst-cell)	• O2S front ready • Fuel cut off not active • Injection mode change not active • Depending on engine state: • Engine part load • Engine full load • Engine idle • For time >= 3.0 s	• 10.0 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to ⇒ “3.6.26 Oxygen Sensor 1 Before Catalytic Converter GX10 , Checking”, page 899 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/Performance Bank 1	Secondary Air Injection (AIR) Pressure Sensor Rationality Check	• Difference between AIR pressure and barometric pressure > 6.0 kPa • And • Difference between AIR pressure and intake manifold pressure > 6.0 kPa	• Engine stop • For time not calibrated [s]	• 0.1 s • Multiple	• 2 DCY	– Check the Secondary Air System - GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 - G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Secondary Air Injection (AIR) Pressure Sensor Out Of Range Low	• Sensor voltage < 0.50 V		• 0.1 s • Continuous	• 2 DCY	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – Check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Secondary Air Injection (AIR) Pressure Sensor Out Of Range High	• Sensor voltage > 4.50 V		• 0.1 s • Continuous	• 2 DCY	– Check the Secondary Air System -GX24- . Refer to ⇒ “3.6.31 Secondary Air System GX24 , Checking”, page 911 . – check the Secondary Air Injection Sensor 1 -G609- . Refer to ⇒ “3.6.29 Secondary Air Injection Sensor 1 G609 , Checking”, page 907 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Secondary Air Injection (AIR) Valve Functional Check	• 1.8L Ratio relative pressure phase 1 and relative pressure phase 2 > 1.50 [-] • 2.0L Ratio relative pressure phase 1 and relative pressure phase 2 > 1.30 [-]	• General: • AIR pump active • Catalyst heating active • AIR active • MAF 140.0 kg/h • ECT @ cylinder block >= -10; < 115° C • IAT @ manifold >= -10; < 100° C • Modeled catalyst temperature < 700° C • Relative barometric pressure > 0.73 [-] • Diff. BARO vs. MAP not calibrated kPa • Engine not calibrated	• 0.1 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve - N112- . Refer to ⇒ “3.6.30 Secondary Air Injection Solenoid Valve N112 , Checking”, page 909 . – Check the Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- . Refer to ⇒ “3.6.28 Secondary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101 , Checking”, page 904 .
P2450 EVAP System Switching Valve Performance/ Stuck Open	Evaporative Emission (EVAP) System Rationality Check	• Time after measurement start > 2.0; < 2.5 s • And • Drop of evap pump current < 3.0 mA	• Barometric pressure > 73.0 kPa • AAT 4 – 38° C • ECT @ start >= 4° C • Vehicle speed < 1 km/h • Time since engine start in preceding dcy >= 600.0 s • Difference between ECT and AAT @ start not calibrated K • propulsion off time >= 21,600.0 s • Engine stop (during ECM keep alive-time) • Airbag not activated	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144- . Refer to ⇒ “3.6.22 Leak Detection Pump V144 , Checking”, page 890 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2563 Turbocharger Boost Control Position Sensor "A" Circuit Range/Performance	Turbocharger (TC) Position Sensor Adaptation Monitoring: Functional Check	• Boost pressure actuator sensor voltage > 4.52; < 2.73 V	• Gradient of boost pressure >= -2.98%/s	• 0.3 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2564 Turbocharger Boost Control Position Sensor "A" Circuit Low	Turbocharger (TC) Position Sensor Short To Ground / Open Circuit	• Turbocharger boost control position sensor voltage < 0.20 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861
P2565 Turbocharger Boost Control Position Sensor "A" Circuit High	Turbocharger (TC) Position Sensor Short To Battery Plus	• Turbocharger boost control position sensor voltage > 4.80 V		• 0.5 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator -V465- . Refer to ⇒ “3.6.7 Charge Air Pressure Actuator V465 , Checking”, page 861

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P2610 ECM/ PCM Engine Off Timer Performance	Engine Off Time Rationality Check	• Difference between engine-off time and ECM keep alive-time > 12.0 s	• Monitor Entry Conditions: • ECM keep alive time active • Delay time >= 1.0 s • Last ECM activation time >= 2.0 s • Time after last engine stop < 48 h • Case 1: • For time (after entry conditions fulfilled) >= 65.0 s • Case 2: • For time (after entry conditions fulfilled) < 65.0 s • Ignition key transition off to on	• 10.0 ms • Once / DCY	• 2 DCY	– Check power and ground inputs to ECM first. Refer to appropriate wiring schematic for pin locations. If all powers/ grounds to ECM are present, replace the Engine Control Module -J623- . Refer to appropriate repair manual.
		• 1.8L Difference between engine-off time and ECM keep alive-time >= 12.0 s • 2.0L Difference between engine-off time and ECM keep alive-time >= 50.0 s	• Time after engine stop < 86,400.0 s • Engine off time plausible • Engine off time monitoring not finished • Engine off time signal valid • Time after reset < 2.0 s • Case 1: • Engine off timer not calibrated • Engine off time not calibrated s • Case 2: • ECM internal timer active • SPI communication failure after reset detected	• 0.01 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
	Engine Off Time ECM Internal Timer Check	• ECM internal timer failure • ECM internal timer signal not calibrated • ECM internal timer not calibrated • Time after last engine stop not calibrated h	• SPI initialization finished	• 1.3 s • Continuous		
P3043 Fuel Pump Mechanical Malfunction	COM: Fuel Pump Control Module (FPCM) functional check: pump blocked	• Phase current > 20 A		• 1.0 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P3044 Fuel Pump "A" Control Circuit Low	COM: Fuel Pump Control Module (FPCM) short circuit	• Phase current > 25 A		• 1.0 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .
P3045 Fuel Pump Electronics Faulty	COM: Fuel Pump Control Module (FPCM) functional check: electronics	• Internal check failed		• 1.0 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ “3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing”, page 873 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
P3073 Fuel Pump "A" Control Circuit/ Open	COM: Fuel Pump Control Module (FPCM) open circuit	• Phase current < 0.8 A		• 1.0 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- . Refer to ⇒ "3.6.13 Fuel Delivery Unit GX1 / Fuel Pump Control Module J538 , Testing", page 873 .
P334A Charge Pressure Actuator Electrical Error	Turbocharger (TC) Boost Pressure Control Short Circuit	• Bypass valve driver current> 9.3 – 15.0 A	• Boost pressure control active	• 0.4 s • Continuous	• 2 DCY	– Check the Charge Pressure Actuator - V465- . Refer to ⇒ "3.6.7 Charge Air Pressure Actuator V465 , Checking", page 861 – Check the Turbocharger Recirculation Valve - N249- . Refer to ⇒ "3.6.34 Turbocharger Recirculation Valve N249 , Checking", page 918 .
U0001 High Speed CAN Communication Bus	CAN: Powertrain BUS Reading Back Sent Message Powertrain	• Message no feedback	• Time after ignition on 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0002 High Speed CAN Communication Bus Performance	CAN: Powertrain Bus Communication Check	• Global timeout >= 0.4 s	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0101 Lost Communication with TCM	COM: Transmission Control Module (TCM) Communication With TCM	• Received message no message	• Time after ignition on 0.5 s	• 1.0 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module and the Engine Control Module - J623- . Refer to ⇒ "3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking", page 859 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module	COM: Brake System Control Module (BSCM) Communication With BSCM	• Received message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0140 Lost Communication With Body Control Module	COM: Body Control Module (BCM) Communication With BCM	• Received message no message	• Time after ignition on 0.5 s	• 2.0 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0146 Lost Communication With Gateway "A"	COM: Gateway Communication With Gateway	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	COM: Instrument Panel Cluster IPC Communication With IPC	• Received CAN message no message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U0302 Software Incompatibility With Transmission Control Module	Engine Control Module (ECM): Coding Code Check Of ECM Concerning TCM	• Received AT vehicle data TCM signal		• 50.0 s • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0323 Software Incompatibility With Instrument Panel Control Module	COM: Ambient Air Temperature (AAT) Sensor Communication With IPC	• Ambient temperature sensor: Source configuration failure	• Time after ignition on > 1.2 s	• 1.0 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0402 Invalid Data Received From TCM	COM: Transmission Control Module (TCM) Communication With TCM	• Received data from TCM implausible message	• Time after ignition on 0.5 s	• 0.3 s • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module . Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module	COM: Vehicle Speed Sensor (VSS) Communication With VSS	• Speed sensor signal: sensor error 327.42 km/h	• Time after ignition on > 500.0 ms	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
		• Speed sensor signal: initialization error 327.08 km/h				
		• Speed sensor signal: low voltage error 327.25 km/h				
		• Speed sensor signal: range error 326.40 – 327.07 km/h • Speed sensor signal: range error 327.09 – 327.24 km/h • Speed sensor signal: range error 327.26 – 327.41 km/h • Speed sensor signal: range error 327.43 – 327.67 km/h				
	COM: Brake System Control Module (BSCM) Communication With BSCM	• Received data from TCS implausible message	• Time after ignition on >= 0.5 s			
	Vehicle Speed Sensor (VSS) Rationality Check High	• Vehicle speed > 325 km/h		• 2.0 s • Continuous		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	MIL Illumination	Component Diagnostic Procedure
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	COM: Instrument Panel Cluster IPC or Communication With IPC	• Received data from IPC implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285- . Refer to appropriate repair manual.
	COM: Ambient Air Temperature (AAT) Sensor Communication With AAT Sensor	• Ambient air temperature signal failure	• Time after ignition on > 0.5 s	• 0.6 s • Continuous		
	COM: Ambient Air Temperature (AAT) Sensor Communication With IPC	• Ambient temperature sensor: source in reset failure	• Time after ignition on > 1.2 s • Engine running	• 2.0 s • Continuous		
U0447 Invalid Data Received From Gateway "A"	COM: Gateway Communication With Gateway	• Received data from gateway implausible message	• Time after ignition on >= 0.5 s	• 0.5 s • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.5 CAN-Bus Terminal Resistance, Checking", page 857 .
U1103 Production Mode Active	Engine Control Module (ECM): Production Mode Function Monitoring: Mode Change	• Production mode active	• Vehicle speed < 5 km/h • Max trip mileage since initial vehicle start-up < 100 km • During ECM keep alive-time after ignition off • Engine speed 0 RPM • For hybrid: • Drive motor off	• 0.01 s • Continuous	• 1 DCY	– Vehicle is in production mode. Refer to appropriate repair manual for resolution. Note the mode can be deactivated with a factory scan tool or will automatically turn off after vehicle accumulates the first 100 km (62.14 miles) of driving.

3.5 Transmission DTC Tables

- ⇒ "3.5.1 Transmission Control Module, 6 speed 09G (2013 – 2015 MY)", page 806

- ⇒ “3.5.2 Transmission Control Module , 6 speed 09G (2016 MY)”, page 819
- ⇒ “3.5.3 Transmission Control Module , 6 speed 09G (2017 MY)”, page 833

3.5.1 Transmission Control Module , 6 speed 09G (2013 – 2015 MY)

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0604	Internal Control Module Random Access Memory (RAM) Error	• RAM area check	• Comparison of writing data and reading data	• Writing data is different from reading one		• 40.0 s	• 2 DCY
P0605	Internal Control Module Read Only Memory (ROM) Error	• ROM area check	• Comparison of stored checksum value and calculated checksum	• Two checksum values are not same		• 40.0 s	• 2 DCY
P0613	TCM Processor	• 2nd CPU detects miscalculation	• Check-calculation of first CPU failed	• Single reset does not cover problem		• 5.0 s	• 2 DCY
P0614	ECM/ TCM Incompatible	• CAN receive data check	• Detection of error signal	• Transmission coding is manual transmission code (0Fh) • Or • Max torque is not same as one in ATCU	• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P0705	Transmission Range Sensor "A" Circuit (PRNDL Input)	• A, B, C and PA signal check in every shift lever position.	• Detection of wrong combination of the A, B, C and PA signal	• Wrong combination for more than 350.0 ms		• 350.0 ms	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0715	Input Turbine/ Speed Sensor "A" Circ	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.2 volt (AD value < 45) for more than 100.0 ms • Or • (AD value > 545) voltage > 3.8 volt for more than 100.0 ms	• Input sensor: no failure decision for input sensor no pulse failure	• 100.0 ms • 5 times	• 2 DCY
P0716	Input/Turbine Shaft Speed Sensor "A" Circuit Range/ Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of input sensor more than 125.0 ms	• Engine speed > 400 RPM • Output sensor: ACTIVE • Output speed >= 300 RPM • Input sensor: no during failure detection or after failure decision for input sensor electrical failure	• 125.0 ms • 4 times	• 2 DCY
P0720	output Shaft Speed Sensor Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.2 volt (AD value < 45) for more than 100.0 ms • Or • (AD value > 545) voltage > 3.8 volt for more than 100.0 ms	• Output sensor: no failure decision for output sensor no pulse	• 100.0 ms • 5 times	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/ Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of output sensor more than 250.0 ms	• Engine speed: > 400 RPM • Input sensor: ACTIVE • Calculated output speed by input speed: >= 300 RPM • Main solenoid switch: ON • Gear condition: Engage • Range: D,S • Inhibitor switch: no fault • Output sensor: no during failure detection or after failure decision for output sensor electrical failure • Solenoid: no fault (except S2) • Linear solenoid: no fault	• 250.0 ms • 2 times	• 2 DCY
P0725	Engine Speed Input Circuit	• CAN receive data check	• Detection of error signal		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0729	Gear 6 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0731	Gear 1 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• ABS (input rev – output rev x other gear ratio) < (0.04 x other gear ratio x output rev) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Estimated engine torque > 100 Nm at 1st gear > 80 Nm at 1st EB gear • Shift lever D or S • Brake: OFF • Slip difference of output speed and ABS difference < 10% (in case of ABS failure, this condition isn't activated) • Engaged gear, 1st gear • Revolution sensor, no back up condition • Model oil temperature >= 20° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Neutral condition check	• Detection of slip condition	• Input revolutions > output revolutions x 1st gear ratio + 400 RPM for more than 3.3 s	• Engine speed > 400 RPM • Shift lever D or S • Output revolutions <= 500 rpm • Output revolutions which <= 500 RPM calculated from ABS (In case of ABS failure, this condition isn't activated) • L-up condition: OFF • Input sensor, no back up condition • Output sensor, active or back up by ABS • Model oil temperature >= 0° C • Common parameter, common condition	• 2 times	• 2 DCY • cumulative but, in case of changing the shift lever position, counter = 0

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0732	Gear 2 Incorrect Ratio	• Neutral condition check	• Detection of slip condition	• Input revolutions > output revolutions x 1st gear ratio + 400 RPM for more than 3.3 s	• Engine speed > 400 RPM • Shift lever D or S • Output revolutions <= 500 RPM • Output revolutions which <= 500 RPM calculated from ABS (In case of ABS failure, this condition isn't activated) • L-up condition: OFF • Input sensor, no back up condition • Output sensor, active or back up by ABS • Model oil temperature >= 0° C • Common parameter, common condition	• 2 times	• 2 DCY • cumulative but, in case of changing the shift lever position, counter = 0

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative
P0733	Gear 3 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0734	Gear 4 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative
P0735	Gear 5 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition	• 1.0 s • 12 times	• 2 DCY • cumulative

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0743	Torque Converter Clutch Circuit Electrical	• Input AD value check in every Linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333 mA (AD: 1,000)	• 2 times	• 2 DCY • continuously
P0748	Pressure Control Solenoid "A" Electrical	• Input AD value check in every Linear solenoid.	• detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333.0 mA (AD: 1,000)	• 2 times	• 2 DCY • continuously
P0753	Shift Solenoid "A" Electrical	• Conduction check in ON/OFF solenoid.	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0798	Pressure Control Solenoid "C" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333.0 mA (AD: 1,000)	• 2 times	• 2 DCY • Continuously
P0811	Excessive Clutch "A" Slippage	• OFF stuck check.	• Comparison of engine RPM and input RPM	• Engine RPM – input RPM > 100 RPM for 2.0 s	• Engine speed > 400 RPM • Shift lever D or S • Engine speed < 4,000 RPM • Estimated engine torque >= 0 Nm • Revolution sensor, no back up condition • SLU target current > 1,000.0 mA • Model oil temperature >= 20° C • Common parameter, common condition	• 2.0 s • 6 times	• 2 DCY • Continuously

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0864	TCM Communication Circuit Range/Performance	• CAN communication check	• Detection of communication error (all frames which are entered in ATCU)	• ECU no communication for more than 50.0 ms (In case of repeat rate is over 25.0 ms, double value of repeat rate is used)	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: ON	• 500.0 ms (In case of re peat rate is over 50.0 ms, 10 times value of repeat rate is used)	• 2 DCY
			• Detection of communication error (one frame which is entered in ATCU)	• ECU no communication for more than 50.0 ms (In case of repeat rate is over 25.0 ms, double value of repeat rate is used)	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: ON • ECU communication: not in no communication failure	• 1,000.0 ms (In case of repeat rate is over 50.0 ms, 20 times value of repeat rate is used)	
		• CAN receive data check	• ECU signal data freeze (data counter (ID488, Byte8, Bit7…4) not updated)		• CAN bus: ACTIVE • CAN data repeat rate: the space of time between two received messages has not exceeded double the transmission cycle time	• No update in five message	
		• CAN communication check	• Detection of communication error	• No acknowledge condition for more than 300.0 ms	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: on	• 300.0 ms	
P0865	TCM Communication Circuit Low	• CAN communication check	• Detection of communication error	• CAN BUS off condition for more than 250.0 ms	• Time 500.0 ms after ignition: on	• 250.0 ms	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2122	Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	• CAN communication check	• Detection of error signal		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P2637	Torque Management Feedback Signal "A"	• CAN receive data check for “signal invalid”	• Detection of error signal (0xFF)		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P2716	Pressure Control Solenoid "D" Electrical	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5 times	• 2 DCY
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333.0 mA (AD: 1,000)	• 2 times	• 2 DCY • continuously
P2725	Pressure Control Solenoid "E" Electrical	• Input AD value check in every Linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5 times	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333.0 mA (AD: 1,000)	• 2 times	• 2 DCY • continuously
P2734	Pressure Control Solenoid "F" Electrical	• Input AD value check in every Linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5 times	• 2 DCY
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000 Ω	• Linear feedback current is > 23.0 mA (AD:15) < 1,333.0 mA (AD: 1,000)	• 2 times	• 2 DCY • continuously

3.5.2 Transmission Control Module , 6 speed 09G (2016 MY)

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0602	Control Module Programming Error	• ROM area check	• To detect dummy calibration flag 0xAA			• 40.0 s • Continuous	• 2 DCY
P0613	TCM Processor	• 2nd CPU detects miscalculation	• Check-calculation of 1st CPU failed	• Single reset does not cover problem		• 5.0 s • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• TCM program miscaclutation	• To detect TCM program flow problem	• CPU core check • ROM check • RAM data protection • Program flow check		• 200.0 ms • Continuous	
P0700	Transmission Control System Malfunction	ROM area check	• Comparison of stored checksum value and calculated checksum	• Two checksum values are not the same		• 40.0 s • Continuous	• 2 DCY
		RAM area check	• Comparison of writing data and reading data.	• Writing data is different from reading one			
P0706	Transmission Range Sensor "A" Circuit (PRNDL Input)	• A, B, C and PA signal check in every shift lever position.	• Detection of wrong combination of the A, B, C and PA signal	• Wrong combination for more than 350.0 ms		• 350.0 ms	• 2 DCY
P0709	Transmission Range Sensor "A" Circuit Intermittent	• A, B, C and PA signal check in every shift lever position.	• Detection of no signal of the A, B, C and PA signal	• All signals lost		• 350.0 ms	• 2 DCY
P0715	Input Turbine/ Speed Sensor "A" Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.206 V (AD value < 45) for more than 100.0 ms	• Input sensor: No failure decision for input sensor no pulse failure	• 100.0 ms • 5 times	• 2 DCY
				• Voltage > 2.727 V (AD value < 545) for more than 100.0 ms			

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0718	Input/Turbine Shaft Speed Sensor "A" Circuit Intermittent	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of input sensor during 10 pulses of output sensor	• Engine speed > 400 RPM • Output sensor active • Output speed >= 300 RPM • Input sensor not during failure detection or after failure decision for input sensor electrical failure	• 500.0 ms	• 2 DCY
P0720	Output Shaft Speed Sensor Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.206 V (AD value < 45) for more than 100.0 ms	• Output sensor: not after failure decision for output sensor no pulse check	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0721	Output Shaft Speed Sensor Circuit Range/Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of output sensor during 48 pulses of input sensor	• Engine speed: > 400 RPM • No emergency mode • Gear engagement condition engage • Range D,S • Inhibitor switch no fault • Input sensor active • S1,SLC1,SLC2,SLC3,SLC4,SLB1,SLT no fault • (Input rev. / defined current gear ratio) >= 300 RPM • Output sensor not during failure detection or after failure decision for output sensor electrical failure.	• 500.0 ms	• 2 DCY
P0723	Output Speed Sensor Intermittent Signal	• Electrical check	• Detection of wrong input AD value	• Voltage > 2.727 V • (AD value > 545) for more than 100.0 ms	• Output sensor not after failure decision for output sensor "no pulse check"	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0729	Gear 6 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote) ⇒ page 832	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0731	Gear 1 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0732	Gear 2 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0733	Gear 3 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0734	Gear 4 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0735	Gear 5 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	• Off stuck check	• Comparison of engine rpm and input RPM	• Engine rpm – input RPM > -100 RPM for 2.0 s (hybrid only) • Engine rpm – input RPM > 100 RPM for 2.0 s	• Engine speed > 400 RPM < 4,000 RPM • Shift lever D or S • Estimated engine torque >= 0.0 Nm • Revolution sensor no back up condition • SLU target current > 1,000.0 mA • Model oil temp. >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 2.0 s • 6 times • Continuous	• 2 DCY
P0748	Pressure Control Solenoid "A" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0778	Pressure Control Solenoid "B" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0796	Pressure Control Solenoid "C" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0797	Pressure Control Solenoid "C" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0798	Pressure Control Solenoid "C" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0962	Pressure Control Solenoid "A" Control Circuit Low	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0963	Pressure Control Solenoid "A" Control Circuit High	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0973	Shift Solenoid "A" Control Circuit Low	• Conduction check in ON/OFF solenoid	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5 times • Continuous	• 2 DCY
P0974	Shift Solenoid "A" Control Circuit High	• Conduction check in ON/OFF solenoid	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5 times • Continuous	• 2 DCY
P2711	Unexpected Mechanical Gear Disengagement	• To check solenoid state	• Check of solenoid state pattern and input torque	• To detect braking torque < 921.0 Nm		• 700.0 ms • Continuous	• 2 DCY
P2714	Pressure Control Solenoid "D" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2715	Pressure Control Solenoid "D" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2716	Pressure Control Solenoid "D" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2725	Pressure Control Solenoid "E" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P2757	Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2758	Torque Converter Clutch Pressure Control Solenoid Control Circuit Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	**Fault Code Description**	**Monitor Strategy Description**	**Malfunction Criteria**	**Threshold Value**	**Secondary Parameters with Enable Conditions**	**Monitoring Time Length**	**Frequency of checks, MIL Illum**
U0001	High Speed CAN Communication Bus	• CAN communication check	• Detection of communication error	• CAN BUS off condition for more than 250.0 ms	• Ignition on > 500.0 ms	• 250.0 ms • Continuous	• 2 DCY
U0100	Lost Communication With ECM/ PCM "A"	• CAN communication check	• Detection of communication error	• ECU no communication for more than 50.0 ms	• CAN bus active • Ignition on > 500.0 ms	• 500.0 ms • Continuous	• 2 DCY
U0301	Software Incompatibility With ECM/ PCM	• CAN receive data check	• Detection of error signal	• Transmission coding is manual transmission code (0Fh) • Or • Max torque is not same as one in ATCU	• CAN bus active • ECU communication active • ECU data update active	• 250.0 ms • Continuous	• 2 DCY
U0401	Invalid Data Received From ECM/ PCM "A"	• CAN receive data check	• ECU signal data freeze	• Data counter not updated	• CAN bus active • ECU communication Active	• 250.0 ms • Continuous	• 2 DCY
			• Detection of error signal	• 0xFF	• CAN bus active • ECU communication active • ECU data update active		

Footnote:

Common parameter for enabling gear ratio or lock up errors:

- ♦ main solenoid switch ON
- ♦ gear condition engaged
- ♦ S1 solenoid No fault
- ♦ linear solenoid no fault
- ♦ inhibitor switch no fault
- ♦ CAN communication no fault
- ♦ ECU data update no fault

- estimated engine torque no fault
- engine speed no fault
- accelerator pedal no fault
- T/M coding and MDI max info no fault
- ROM no fault
- RAM no fault
- safety processor no fault

3.5.3 Transmission Control Module , 6 speed 09G (2017 MY)

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0602	Control Module Programming Error	• ROM area check	• To detect dummy calibration flag 0xAA			• 40.0 s • Continuous	• 2 DCY
P0613	TCM Processor	• 2nd CPU detects miscalculation	• Check-calculation of 1st CPU failed	• Single reset does not cover problem		• 5.0 s • Continuous	• 2 DCY
		• TCM program miscaclutation	• To detect TCM program flow problem	• CPU core check • ROM check • RAM data protection • Program flow check		• 200.0 ms • Continuous	
P0700	Transmission Control System Malfunction	ROM area check	• Comparison of stored checksum value and calculated checksum	• Two checksum values are not the same		• 40.0 s • Continuous	• 2 DCY
		RAM area check	• Comparison of writing data and reading data.	• Writing data is different from reading one			
P0706	Transmission Range Sensor "A" Circuit (PRNDL Input)	• A, B, C and PA signal check in every shift lever position.	• Detection of wrong combination of the A, B, C and PA signal	• Wrong combination for more than 350.0 ms		• 350.0 ms	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0709	Transmission Range Sensor "A" Circuit Intermittent	• A, B, C and PA signal check in every shift lever position.	• Detection of no signal of the A, B, C and PA signal	• All signals lost		• 350.0 ms	• 2 DCY
P0715	Input Turbine/ Speed Sensor "A" Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.206 V (AD value < 45) for more than 100.0 ms • Voltage > 2.727 V (AD value < 545) for more than 100.0 ms	• Input sensor: No failure decision for input sensor no pulse failure	• 100.0 ms • 5 times	• 2 DCY
P0718	Input/Turbine Shaft Speed Sensor "A" Circuit Intermittent	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of input sensor during 10 pulses of output sensor	• Engine speed > 400 RPM • Output sensor active • Output speed >= 300 RPM • Input sensor not during failure detection or after failure decision for input sensor electrical failure	• 500.0 ms	• 2 DCY
P0720	Output Shaft Speed Sensor Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.206 V (AD value < 45) for more than 100.0 ms	• Output sensor: not after failure decision for output sensor no pulse check	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0721	Output Shaft Speed Sensor Circuit Range/ Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of output sensor during 48 pulses of input sensor	• Engine speed: > 400 RPM • No emergency mode • Gear engagement condition engage • Range D,S • Inhibitor switch no fault • Input sensor active • S1,SLC1,SLC2,SLC3,SLC4,SLB1,SLT no fault • (Input rev. / defined current gear ratio) >= 300 RPM • Output sensor not during failure detection or after failure decision for output sensor electrical failure.	• 500.0 ms	• 2 DCY
P0723	Output Speed Sensor Intermittent Signal	• Electrical check	• Detection of wrong input AD value	• Voltage > 2.727 V • (AD value > 545) for more than 100.0 ms	• Output sensor not after failure decision for output sensor "no pulse check"	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0729	Gear 6 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0731	Gear 1 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0732	Gear 2 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0733	Gear 3 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0734	Gear 4 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0735	Gear 5 Incorrect Ratio	• Input and output rpm signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input rev. – output 2 DCY rev. x other gear ratio) < (0.04 x other gear ratio x output rev.) for more than 450.0 ms (5 times)	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake off • Slip difference of output speed (In case ABS valid) difference < 10% • Revolution sensor no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 1.0 s • 12 times • Cumulative • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0741	Torque Converter Clutch Circuit Performance/ Stuck Off	• Off stuck check	• Comparison of engine rpm and input RPM	• Engine rpm – input RPM > -100 RPM for 2.0 s (hybrid only) • Engine rpm – input RPM > 100 RPM for 2.0 s	• Engine speed > 400 RPM < 4,000 RPM • Shift lever D or S • Estimated engine torque >= 0.0 Nm • Revolution sensor no back up condition • SLU target current > 1,000.0 mA • Model oil temp. >= 20° C • Common parameter, common condition (see footnote ⇒ page 846)	• 2.0 s • 6 times • Continuous	• 2 DCY
P0748	Pressure Control Solenoid "A" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0776	Pressure Control Solenoid "B" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0777	Pressure Control Solenoid "B" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0778	Pressure Control Solenoid "B" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0796	Pressure Control Solenoid "C" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0797	Pressure Control Solenoid "C" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0798	Pressure Control Solenoid "C" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P0962	Pressure Control Solenoid "A" Control Circuit Low	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P0963	Pressure Control Solenoid "A" Control Circuit High	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0973	Shift Solenoid "A" Control Circuit Low	• Conduction check in ON/OFF solenoid	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5 times • Continuous	• 2 DCY
P0974	Shift Solenoid "A" Control Circuit High	• Conduction check in ON/OFF solenoid	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5 times • Continuous	• 2 DCY
P2711	Unexpected Mechanical Gear Disengagement	• To check solenoid state	• Check of solenoid state pattern and input torque	• To detect braking torque < 921.0 Nm		• 700.0 ms • Continuous	• 2 DCY
P2714	Pressure Control Solenoid "D" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2715	Pressure Control Solenoid "D" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2716	Pressure Control Solenoid "D" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2723	Pressure Control Solenoid "E" Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value < 15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2724	Pressure Control Solenoid "E" Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2725	Pressure Control Solenoid "E" Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY
P2757	Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance/ Stuck Off	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current < 23.0 mA • (AD value <15) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2758	Torque Converter Clutch Pressure Control Solenoid Control Circuit Stuck On	• Input AD value check in every Linear solenoid	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA • (AD value > 1,000) for more than 100.0 ms	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 100.0 ms • 5 times • Continuous	• 2 DCY
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical	• Linear solenoid feedback current stuck check	• Comparison of target current and feedback current	• Sum of difference of two current > 15,000	• D value < 1,333.0 mA • Voltage > 10.5 V • Main solenoid sw on	• 2 times • Continuous	• 2 DCY

AQ-250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
U0001	High Speed CAN Communication Bus	• CAN communication check	• Detection of communication error	• CAN BUS off condition for more than 250.0 ms	• Ignition on > 500.0 ms	• 250.0 ms • Continuous	• 2 DCY
U0100	Lost Communication With ECM/ PCM "A"	• CAN communication check	• Detection of communication error	• ECU no communication for more than 50.0 ms	• CAN bus active • Ignition on > 500.0 ms	• 500.0 ms • Continuous	• 2 DCY
U0301	Software Incompatibility With ECM/ PCM	• CAN receive data check	• Detection of error signal	• Transmission coding is manual transmission code (0Fh) • Or • Max torque is not same as one in AT-CU	• CAN bus active • ECU communication active • ECU data update active	• 250.0 ms • Continuous	• 2 DCY
U0401	Invalid Data Received From ECM/ PCM "A"	• CAN receive data check	• ECU signal data freeze	• Data counter not updated	• CAN bus active • ECU communication Active	• 250.0 ms • Continuous	• 2 DCY
			• Detection of error signal	• 0xFF	• CAN bus active • ECU communication active • ECU data update active		

Footnote:

Common parameter for enabling gear ratio or lock up errors:

- main solenoid switch ON
- gear condition engaged
- S1 solenoid No fault
- linear solenoid no fault
- inhibitor switch no fault
- CAN communication no fault
- ECU data update no fault

- estimated engine torque no fault
- engine speed no fault
- accelerator pedal no fault
- T/M coding and MDI max info no fault
- ROM no fault
- RAM no fault
- safety processor no fault

3.6 Diagnostic Procedures

3.6.1 Accelerator Pedal Module - GX2- , Checking

General Description

The Accelerator Pedal Position Sensor - G79- and Accelerator Pedal Position Sensor 2 - G185- are combined in one component and integrated into the Accelerator Pedal Module - GX2- . They are used to detect the position of the accelerator pedal throughout the entire adjustment range. The Engine Control Module - J623- detects the driver’s request from these signals and uses them to calculate the injection quantity and EPC Throttle valve operation.

The Accelerator Pedal Module - GX2- contains the following components:

- Accelerator Pedal Position Sensor - G79-
- Accelerator Pedal Position Sensor 2 - G185-

The Accelerator Pedal Module - GX2- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.

- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 849 . – NO: ♦ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 97%. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ Condition may be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 851 . – NO: ♦ GO TO: Step 3 ⇒ page 849 .
3	• DISCONNECT: Accelerator Pedal Module - GX2- harness connector. • IGNITION: ON. • CHECK: Accelerator Pedal Module - GX2- harness connector terminals 1 to 5 and 2 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 850 . – NO: ♦ GO TO: Step 5 ⇒ page 850 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91 / 52 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 6 to the Engine Control Module - J623- harness connector T91 / 69 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Accelerator Pedal Module - GX2- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 851 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 851 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91 / 16 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91 / 33 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 34 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 5 to the Engine Control Module - J623- harness connector T91 / 51 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 6 ⇒ page 851 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 851 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.2 After-Run Coolant Pump - V51- , Checking

General Description

The following procedure is used to diagnose the After-Run Coolant Pump - V51- that is cycled on and off by the Engine Control Module - J623- .

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Man. Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO Step 2 ⇒ page 852 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: After-Run Coolant Pump - V51- harness connector. • IGNITION: ON. • CHECK: After-Run Coolant Pump - V51- harness connector terminals 1 to 2 and 2 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 852 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 852 .
3	• REMOVE: Engine Control Module - J623- . Refer to the appropriate repair manual. • CHECK: After-Run Coolant Pump - V51- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 84 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: After-Run Coolant Pump - V51- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 852 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 852 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return the repair is complete. ◆ Return vehicle to customer.

3.6.3 Camshaft Adjustment Valve 1 - N205- , Checking

General Description

The camshaft's task is to operate the valves at the right time and in the right order to control the charge cycle. Camshaft adjustment using the Camshaft Adjustment Valve 1 - N205- varies the opening times of the valves to suit all operating conditions. This ensures ideal charge cycles within a wide range of engine speeds and loads. Fuel consumption and pollutant emissions are reduced, torque and smoothness increased. In engines with a double overhead camshaft the size and positioning of the valve opening overlap can be influenced, enhancing characteristics in full-load and part-load operation. In continuous camshaft adjustment, the adjustment is infinitely variable within specific parameters.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 853 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Camshaft Adjustment Valve 1 - N205- harness connector. • CHECK: Camshaft Adjustment Valve 1 - N205- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 to 20 Ω (at approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 854 . – NO: ♦ REPLACE: Camshaft Adjustment Valve 1 - N205- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 854 .

Step	Procedure	Result / Action to Take
3	• IGNITION: ON. • CHECK: Camshaft Adjustment Valve 1 - N205- harness connector terminal 1 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 854 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 854 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Camshaft Adjustment Valve 1 - N205- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 105 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The Camshaft Adjustment Valve 1 - N205- may fail under loaded operation; please swap a known good Camshaft Adjustment Valve 1 - N205- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 854 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 854 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.4 Camshaft Position Sensor - G40- , Checking

General Description

Using the signal from the Camshaft Position Sensor - G40- , the precise position of the camshaft relative to the crankshaft is determined very quickly when the engine is started. Used in combination with the signal from the Engine Speed Sensor - G28- , the signal from the Camshaft Position Sensor - G40- allows the Engine Control Module - J623- to detect which cylinder is at TDC. The fuel can be injected into the corresponding cylinder and ignited.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 855 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Camshaft Position Sensor - G40- harness connector. • IGNITION: ON. • CHECK: Camshaft Position Sensor - G40- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 856 . – NO: ♦ GO TO: Step 4 ⇒ page 856 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Camshaft Position Sensor - G40- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 30 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Camshaft Position Sensor - G40- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 856 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 856 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Camshaft Position Sensor - G40- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 48 for resistance. • CHECK: Camshaft Position Sensor - G40- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 47 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 856 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 856 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return the repair is complete. ◆ Return vehicle to customer.

3.6.5 CAN-Bus Terminal Resistance, Checking

General Description

The Engine Control Module - J623- communicates with other CAN-Bus capable control modules.

The control modules are connected by two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Missing information on the CAN-bus is recognized as a malfunction by the Engine Control Module - J623- and the other control modules connected to the CAN-bus.

Trouble-free operation of the CAN-Bus requires that it have a terminal resistance. This central terminal resistance is located in the Engine Control Module - J623- .

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 858 . – NO: ♦ GATHER more information from customer about the complaint.

Step	Procedure	Result / Action to Take
2	• DISCONNECT: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- harness connector. • DISCONNECT: For Passat, the Instrument Cluster Control Module - J285- harness connector. • The Engine Control Module - J623- must remain connected for the following step. • CHECK: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- harness connector terminals 18 to 19 for resistance. • CHECK: For Passat, the Instrument Cluster Control Module - J285- harness connector terminals 28 to 29 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (at approx. 20° C). – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 859 . – NO: ♦ GO TO: Step 3 ⇒ page 858 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- harness connector terminal 18 to the Engine Control Module - J623- harness connector T91 / 80 for resistance. • CHECK: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- harness connector terminal 19 to the Engine Control Module - J623- harness connector T91 / 79 for resistance. • CHECK: For Passat, the Instrument Cluster Control Module - J285- harness connector terminal 29 to the Engine Control Module - J623- harness connector T91 / 80 for resistance. • CHECK: For Passat, the Instrument Cluster Control Module - J285- harness connector terminal 28 to the Engine Control Module - J623- harness connector T91 / 79 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 859 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 859 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- harness connector for any damaged, pushed-out pins. For Passat, the Instrument Cluster Control Module - J285- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. ♦ If all electrical connections are OK: ♦ REPLACE: For Jetta / Beetle, the Vehicle Electrical System Control Module - J519- . For Passat, the Instrument Cluster Control Module - J285- . Refer to appropriate repair manual. ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.6 CAN-Bus Terminal Resistance, Powertrain, Checking

General Description

The Engine Control Module - J623- communicates with all databus capable control modules via a CAN databus.

These databus capable control modules are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Missing information on the databus is recognized as a malfunction and stored.

Trouble-free operation of the CAN-bus requires that it have a terminal resistance. The central terminal resistor is located in the Engine Control Module - J623- .

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

Test requirements

• Fuses OK.

• Battery voltage OK.

- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 860 . – NO: ♦ GATHER more information from customer about the complaint.
2	• REMOVE: Transmission Control Module - J217- . Refer to appropriate repair manual. • DISCONNECT: Transmission Control Module - J217- harness connector. • CHECK: Harness connector for damage, corrosion, loose, or broken terminals. • REPAIR: As necessary. – Do any DTC’s return:	– YES: ♦ GO TO: Step 3 ⇒ page 860 . – NO: ♦ GO TO: Step 5 ⇒ page 861 .
3	• The Engine Control Module - J623- must remain connected for the following step. The central terminal resistor is located in the Engine Control Module - J623- . • CHECK: Transmission Control Module - J217- harness connector T52 / 34 to 46 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (at approx. 20° C). – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 861 . – NO: ♦ GO TO: Step 4 ⇒ page 860 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: CAN bus circuit between the Transmission Control Module - J217- harness connector T52 / 34 and the Engine Control Module - J623- harness connector T91 / 80 of the for resistance. • CHECK: CAN bus circuit between the Transmission Control Module - J217- harness connector T52 / 46 and the Engine Control Module - J623- harness connector T91 / 79 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 861 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 861 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: DSG Transmission Mechatronic - J743- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: CHECK: DSG Transmission Mechatronic - J743- harness connector for any damaged, pushed-out pins.. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.7 Charge Air Pressure Actuator - V465- , Checking

General Description

The Engine Control Module - J623- computes the nominal charge pressure from the requested torque. If the actual charge pressure deviates from the nominal charge pressure, the wastegate* is opened further by the Charge Air Pressure Actuator - V465- (charge pressure decreases) or closed further (charge pressure increases). The rapid response of the Charge Air Pressure Actuator - V465- ensures that the wastegate opens quickly in overrun mode, thereby reducing the pumping effort of the turbocharger. The wastegate is closed in the start position. The Charge Air Pressure Actuator - V465- is activated by the PWM signal, and the Charge Air Pressure Actuator Position Sensor - G581- provides position feedback.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

• Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".

- Vehicles with Man. Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 862 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Charge Air Pressure Actuator - V465- harness connector. • IGNITION: ON. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 862 . – NO: ♦ GO TO: Step 3 ⇒ page 862 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 863 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 863 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 88 for resistance. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminal 5 to the Engine Control Module - J623- harness connector T105 / 41 for resistance. • CHECK: Charge Air Pressure Actuator - V465- harness connector terminal 6 to the Engine Control Module - J623- harness connector T105 / 89 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Charge Air Pressure Actuator - V465- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 863 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 863 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.8 Charge Air Pressure Sensor - G31- , Checking

General Description

The Charge Air Pressure Sensor - G31- is located in the inlet to the intake manifold. The Engine Control Module - J623- uses the sensor's signal to regulate the turbo boost. There is no substitute function in the event of signal failure. Charge air pressure regulation is shut off, leading to a significant reduction in engine output.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 864 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Charge Air Pressure Sensor - G31- harness connector. • IGNITION: ON. • CHECK: Charge Air Pressure Sensor - G31- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 864 . – NO: ♦ GO TO: Step 4 ⇒ page 864 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Charge Air Pressure Sensor - G31- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91 / 55 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Charge Air Pressure Sensor - G31- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 865 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 865 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Charge Air Pressure Sensor - G31- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91 / 35 for resistance. • CHECK: Charge Air Pressure Sensor - G31- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 32 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 865 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 865 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.9 Engine Coolant Temperature Sensor - G62- , Checking

General Description

The Engine Coolant Temperature Sensor - G62- sends information about the current coolant temperature to the Engine Control Module - J623- . It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 866 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Coolant Temperature Sensor - G62- harness connector. • CHECK: Engine Coolant Temperature Sensor - G62- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2,250 Ω (+/- 750 Ω @ approx. 20° C). • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 866 . – NO: ◆ REPLACE: Engine Coolant Temperature Sensor - G62- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 867 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Coolant Temperature Sensor - G62- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 47 for resistance. • CHECK: Engine Coolant Temperature Sensor - G62- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 40 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ TIP: The Engine Coolant Temperature Sensor - G62- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor - G62- prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 867 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 867 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.10 Engine Coolant Temperature Sensor On Radiator Outlet - G83- , Checking

General Description

The Engine Coolant Temperature Sensor On Radiator Outlet - G83- sends information about the current coolant temperature to the Engine Control Module - J623- . It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 868 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2250 Ω (+/- 750 Ω @ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 868 . – NO: ◆ REPLACE: Engine Coolant Temperature Sensor On Radiator Outlet - G83- . Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 869 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91 / 49 for resistance. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet - G83- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91 / 29 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ TIP: The Engine Coolant Temperature Sensor On Radiator Outlet - G83- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor On Radiator Outlet - G83- prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 869 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 869 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.11 Engine Speed Sensor - G28- , Checking

General Description

The Engine Speed Sensor - G28- detects rpm and reference marks from a toothed wheel on the crankshaft. Without an engine speed signal, the engine will not start. If the engine speed signal fails while the engine is running, the engine will stop immediately.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF All electrical and electronic accessories.

• Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".

• Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.

• Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .

• View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 870 . – NO: ♦ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • START or CRANK: Engine. • CHECK: Engine rpm. • SPECIFIED VALUE: Cranking or Idle rpm. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Harness for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 871 . – NO: ♦ GO TO: Step 3 ⇒ page 870 .
3	• DISCONNECT: Engine Speed Sensor - G28- harness connector. • IGNITION: ON. • CHECK: Engine Speed Sensor - G28- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 870 . – NO: ♦ GO TO: Step 5 ⇒ page 871 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Speed Sensor - G28- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 70 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REMOVE: Engine Speed Sensor - G28- . Refer to appropriate repair manual. ♦ CHECK: Engine Speed Sensor - G28- wheel for proper seating, damage and/or run - out. Refer to appropriate repair manual. ♦ Sensor wheel OK. ♦ REPLACE: Engine Speed Sensor - G28- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 871 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 871 .

Step	Procedure	Result / Action to Take
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Engine Speed Sensor - G28- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • CHECK: Engine Speed Sensor - G28- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 6 ⇒ page 871 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 871 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.12 EVAP Canister Purge Regulator Valve 1 - N80- , Checking

General Description

EVAP system is designed so that the admission of fuel vapors takes place only at idle and at light part-throttle. The EVAP Canister Purge Regulator Valve 1 - N80- is map-activated by the Engine Control Module - J623- to accomplish this task.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions:
  ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions:
  ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 872 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: EVAP Canister Purge Regulator Valve 1 - N80- harness connector. • CHECK: EVAP Canister Purge Regulator Valve 1 - N80- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 10 – 35 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 872 . – NO: ♦ REPLACE: EVAP Canister Purge Regulator Valve 1 - N80- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 873 .
3	• IGNITION: ON. • CHECK: EVAP Canister Purge Regulator Valve 1 - N80- harness connector terminal 1 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 872 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 873 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: EVAP Canister Purge Regulator Valve 1 - N80- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 3 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The EVAP Canister Purge Regulator Valve 1 - N80- may fail under loaded operation; please swap a known good EVAP Canister Purge Regulator Valve 1 - N80- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 873 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 873 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.13 Fuel Delivery Unit - GX1- / Fuel Pump Control Module - J538- , Testing

General Description

The Engine Control Module - J623- tells the Fuel Pump Control Module - J538- the demand needed for fuel volume and pressure and activates the Transfer Fuel Pump - G6- . The Transfer Fuel Pump - G6- transfers fuel to the rest of the fuel system, where it is monitored by the Engine Control Module - J623- through sensors, and controlled through regulators and/or metering valves.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF All electrical and electronic accessories.

• Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".

• Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.

• Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .

• View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Note

When the door is opened or the Ignition is turned to the ON position the fuel pump is activated for 2 seconds to build up the pressure in the fuel system.

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 874 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: ON. • LISTEN: Transfer Fuel Pump - G6- should be heard running for 2 sec. • SPECIFIED VALUE: Transfer Fuel Pump ON for 2 s. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ Condition may be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 875 . – NO: ◆ GO TO: Step 3 ⇒ page 874 .
3	• DISCONNECT: Fuel Pump Control Module - J538- . • IGNITION: ON. • CHECK: Fuel Pump Control Module - J538- harness connector terminals 1 to 6 for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 874 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 875 .
4	• RECONNECT: Fuel Pump Control Module - J538- . • DISCONNECT: Transfer Fuel Pump - G6- . • CRANK: Engine. • CHECK: Transfer Fuel Pump - G6- harness connector terminals 1 to 5 for voltage while engine is cranking. • IGNITION: OFF • SPECIFIED VALUE: 7 – 11 V. – Was Value obtained?	– YES: ◆ REPLACE: Transfer Fuel Pump - G6- , Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 875 . – NO: ◆ GO TO: Step 5 ⇒ page 875 .

Step	Procedure	Result / Action to Take
5	• REMOVE: Engine Control Module - J623- . Refer to the appropriate repair manual. • CHECK: Fuel Pump Control Module - J538- harness connector terminal 2 to Engine Control Module - J623- harness connector T91 / 9 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Fuel Pump Control Module - J538- . Refer to the appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 875 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 875 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC’s. ♦ If no DTC’s return the repair is complete. ♦ Return vehicle to customer.

3.6.14 Fuel Injectors , Checking

General Description

The Fuel Injectors are controlled by the Engine Control Module - J623- and are mounted normally in the cylinder head. The fuel injectors spray high-pressure atomized fuel directly into the combustion chamber.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

♦ LED Test Lamp.

Test requirements

• Fuses OK.

- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 876 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Harness connector from suspect Fuel Injector . • CHECK: Suspect Fuel Injector component connector terminals 1 to 2 for resistance (refer to the wiring diagram for proper terminal locations). • SPECIFIED VALUE: 0.5 – 15 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 876 . – NO: ◆ REPLACE: Suspect Fuel Injector (s). Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 877 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Suspect Fuel Injector harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / xx (refer to the wiring diagram for proper terminal locations). • CHECK: Suspect Fuel Injector harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / xx (refer to the wiring diagram for proper terminal locations). • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ TIP: The Fuel Injector may fail under loaded operation; please swap a known good Fuel Injector prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 877 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 877 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.15 Fuel Pressure Regulator Valve - N276- , Checking

General Description

The Engine Control Module - J623- regulates the Fuel Pressure Regulator Valve - N276- directly at the High Pressure Fuel Pump to control the low pressure valve inside the High Pressure Fuel Pump.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 878 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Fuel Pressure Regulator Valve - N276- harness connector. • CHECK: Fuel Pressure Regulator Valve - N276- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 1.5 - 11 (± 0.5) Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 878 . – NO: ♦ REPLACE: Fuel Pressure Regulator Valve - N276- . Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 878 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Fuel Pressure Regulator Valve - N276- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 93 for resistance. • CHECK: Fuel Pressure Regulator Valve - N276- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 92 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The Fuel Pressure Regulator Valve - N276- may fail under loaded operation; please swap a known good Fuel Pressure Regulator Valve - N276- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 878 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 878 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC’s. ♦ If no DTC’s return the repair is complete. ♦ Return vehicle to customer.

3.6.16 Fuel Pressure Sensor - G247- , Checking

General Description

The Fuel Pressure Sensor - G247- measures the fuel pressure in the high-pressure fuel system. The Engine Control Module - J623- analyzes the signal and regulates the fuel high pressure through the Fuel Pressure Regulator Valve - N276- in the high-pressure pump.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 879 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Fuel Pressure Sensor - G247- harness connector. • IGNITION: ON. • CHECK: Fuel Pressure Sensor - G247- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 880 . – NO: ♦ GO TO: Step 4 ⇒ page 880 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Fuel Pressure Sensor - G247- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 49 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Fuel Pressure Sensor - G247- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 880 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 880 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Fuel Pressure Sensor - G247- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • CHECK: Fuel Pressure Sensor - G247- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 880 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 880 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return the repair is complete. ◆ Return vehicle to customer.

3.6.17 Ignition Coils With Power Output Stage , Checking

General Description

The ignition coil must transform the relatively low 12 V on-board vehicle voltage to the high ignition voltage required and supply the energy stored in that voltage to the spark plug. The functional principle of the ignition coil is relatively simple. It has a primary winding (small number of turns) and a secondary winding (lots of turns). The turn ratio between the number of primary and secondary winding turns determines the level of the voltage generated at the output. Ignition Coils With Power Output Stage are plugged directly into the spark plug. This means that the ignition energy can be transferred directly to the spark plug with virtually zero power loss.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.
- ♦ LED Test Lamp.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 881 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: ON. • DISCONNECT: Suspect Ignition Coil With Power Output Stage harness connector. • CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminals 4 to 1 and 3 for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 882 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 882 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / xx for resistance (refer to appropriate wiring diagram for proper terminal locations). • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 882 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 882 .
4	• DISCONNECT: All of the Fuel Injectors . Refer to appropriate wiring diagram. • DISCONNECT: Cold Start Injector (If applicable). • CONNECT: Engine Control Module - J623- harness connector. • CONNECT: LED Test Lamp to Suspect Ignition Coil With Power Output Stage harness connector terminals 4 to 2. • CRANK: Engine. • SPECIFIED VALUE: LED Test Lamp should Flicker ON & OFF. – Was Value obtained?	– YES: ◆ REPLACE: Suspect Ignition Coil With Power Output Stage . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 882 . – NO: ◆ GO TO: Step 5 ⇒ page 882 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.18 Intake Manifold Runner Control Valve - N316- , Checking

General Description

The intake manifold runner valve(s) are mounted on a common shaft and actuated by a vacuum cell. The partial vacuum required for actuation is supplied by the Intake Manifold Runner Control Valve - N316- . The Engine Control Module - J623- activates the Intake Manifold Runner Control Valve - N316- on the basis of a characteristic map.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 883 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Intake Manifold Runner Control Valve - N316- harness connector. • CHECK: Intake Manifold Runner Control Valve - N316- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 – 35 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 884 . – NO: ♦ REPLACE: Intake Manifold Runner Control Valve - N316- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 884 .

Step	Procedure	Result / Action to Take
3	• IGNITION: ON. • CHECK: Intake Manifold Runner Control Valve - N316- harness connector terminal 1 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 884 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 884 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Intake Manifold Runner Control Valve - N316- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 53 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The Intake Manifold Runner Control Valve - N316- may fail under loaded operation; please swap a known good Intake Manifold Runner Control Valve - N316- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 884 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 884 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.19 Intake Manifold Runner Position Sensor - G336- , Checking

General Description

The Intake Manifold Runner Position Sensor - G336- monitors the position of the intake manifold runner flaps. These flaps can be adjusted open or closed to provide longer or shorter intake runners depending on ambient conditions to increase engine efficiency.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 885 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: ON. • DISCONNECT: Intake Manifold Runner Position Sensor - G336- harness connector. • CHECK: Intake Manifold Runner Position Sensor - G336- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 886 . – NO: ♦ GO TO: Step 4 ⇒ page 886 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Intake Manifold Runner Position Sensor - G336- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 36 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Intake Manifold Runner Position Sensor - G336- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 886 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 886 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Intake Manifold Runner Position Sensor - G336- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 48 for resistance. • CHECK: Intake Manifold Runner Position Sensor - G336- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 47 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 886 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 886 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.20 Intake Manifold Sensor - GX9- , Checking

General Description

Air mass and charge pressure are two factors used for engine load management. For this purpose, there are several sensors with absolutely identical functions. They measure the intake air temperature and the intake manifold pressure. The first sender unit is located upstream of the Throttle Valve Control Module - GX3- in the Intake Manifold Sensor - GX9- . They measure the pressure and temperature of the air in each individual cylinder bank. The values measured here correspond to the actual air mass in the cylinder bank(s).

- ♦ Intake Air Temperature Sensor - G42- .
- ♦ Manifold Absolute Pressure Sensor - G71- .

The Intake Manifold Sensor - GX9- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 887 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: ON. • DISCONNECT: Intake Manifold Sensor - GX9- harness connector. • CHECK: Intake Manifold Sensor - GX9- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 888 . – NO: ♦ GO TO: Step 4 ⇒ page 888 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Intake Manifold Sensor - GX9- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 51 for resistance. • CHECK: Intake Manifold Sensor - GX9- harness connector terminal 4 to the Engine Control Module - J623- harness connector T105 / 52 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) – Were Values obtained?	– YES: ♦ REPLACE: Intake Manifold Sensor - GX9- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 888 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 888 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Intake Manifold Sensor - GX9- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • CHECK: Intake Manifold Sensor - GX9- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 48 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 888 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 888 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.21 Knock Sensor 1 - G61- , Checking

General Description

The Knock Sensor 1 - G61- is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The

Engine Control Module - J623- uses this signal to determine the presence of engine knock and to retard spark timing.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 889 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Knock Sensor 1 - G61- harness connector. • CHECK: Knock Sensor 1 - G61- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2,250 Ω (+/- 750 @ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 889 . – NO: ♦ REPLACE: Knock Sensor 1 - G61- . Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 890 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Knock Sensor 1 - G61- harness connector terminals 1 to the Engine Control Module - J623- harness connector T105 / 98 for resistance. • CHECK: Knock Sensor 1 - G61- harness connector terminals 2 to the Engine Control Module - J623- harness connector T105 / 97 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Knock Sensor 1 - G61- may fail under loaded operation; please swap a known good Knock Sensor 1 - G61- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 890 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 890 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.22 Leak Detection Pump - V144- , Checking

General Description

Whenever the engine is running, vacuum is applied to the Vacuum Switch. This switch applies vacuum to the Upper Chamber of the pump when it receives a ground signal from the Engine Control Module - J623- . This signal is a duty cycle pulse of approximately 40%. When vacuum is applied to the Upper Chamber, fresh air flows in through the One-way Inlet Valve, compressing the spring above the diaphragm. When the Diaphragm begins to rise, the Reed Switch, attached to the Diaphragm Rod, opens. When the Vacuum Switch closes, the vacuum in the Upper Chamber is released. As a result, the spring pushes the Diaphragm down. As the Diaphragm is pushed down, the air in the Lower Chamber is pushed out of the One-way Outlet Valve into the EVAP system. This process continues until the pressure in the EVAP system no longer allows the spring to push the Diaphragm down. With tension on the Diaphragm, the ECM waits for a certain period of time to watch for the Diaphragm to fall. The Reed Switch closing signals that the Diaphragm has fallen to its lowest point. When the Reed Switch closes, the ECM may cycle the LDP to build up system pressure again. The ECM measures the time it takes for the Reed Switch to close once the LDP has stopped running to determine if there is a leak in the system. The slower the Diaphragm falls after the pump stops running, the less air is leaking out of the EVAP system.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 891 . – NO: ◆ GATHER more information from customer about the complaint.
2	• REMOVE: Evaporative Canister. Refer to appropriate repair manual. • Plug or Cap off the Leak Detection Pump - V144- port going to the vent filter. • CONNECT: Hand vacuum pump to the Leak Detection Pump - V144- CAN port and apply 0.700 bar and see if the vacuum holds. – Did the vacuum hold?	– YES: ◆ GO TO: Step 3 ⇒ page 891 . – NO: ◆ REPLACE: Leak Detection Pump - V144- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 892 .
3	• IGNITION: OFF. • DISCONNECT: Leak Detection Pump - V144- harness connector. • IGNITION: ON. • CHECK: Leak Detection Pump - V144- harness connector terminal 4 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 892 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 892 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Leak Detection Pump - V144- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91 / 78 for resistance. • CHECK: Leak Detection Pump - V144- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91 / 23 for resistance. • CHECK: Leak Detection Pump - V144- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 39 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Leak Detection Pump - V144- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 892 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 892 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.23 Motronic Engine Control Module Power Supply Relay - J271- , Checking

General Description

The following procedure is used to diagnose the Motronic Engine Control Module Power Supply Relay - J271- and the Engine Control Module - J623- power supply voltage that is provided by the Motronic Engine Control Module Power Supply Relay - J271- .

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 893 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Motronic Engine Control Module Power Supply Relay - J271- from the SB Fuse box in the engine compartment. • CHECK: Motronic Engine Control Module Power Supply Relay - J271- socket terminal 30 to ground for voltage. • CHECK: Motronic Engine Control Module Power Supply Relay - J271- socket terminal 86 to ground for voltage. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 893 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 894 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CONNECT: Jumper wire, Motronic Engine Control Module Power Supply Relay - J271- socket terminals 30 and 87. • CHECK: Engine Control Module - J623- harness connector T91 / 5 and T91 / 6 to ground for voltage. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 894 . – NO: ♦ GO TO: Step 5 ⇒ page 894 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Jumper wire, Motronic Engine Control Module Power Supply Relay - J271- socket terminals 30 and 87. • CHECK: Motronic Engine Control Module Power Supply Relay - J271- socket terminal 85 to the Engine Control Module - J623- harness connector T91 / 7 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Motronic Engine Control Module Power Supply Relay - J271- . Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 894 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 894 .
5	• REMOVE: Jumper wire, Motronic Engine Control Module Power Supply Relay - J271- socket terminals 30 and 87. • REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • REMOVE: Appropriate fuse. Refer to appropriate repair manual. • CHECK: Downstream (output) side of the fuse to Engine Control Module - J623- harness connector T91 / 5 and T91 / 6 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Fuse Panel B - SB- fuse box. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 894 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 894 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.24 Outside Air Temperature Sensor - G17- , Checking

General Description

The ambient or Outside Air Temperature Sensor - G17- is a negative temperature coefficient (NTC) sensor that informs the semiautomatic / automatic temperature control system of outside air temperature. An NTC sensor resistance decreases as the temperature increases, and the sensor resistance increases as the temperature decreases. The computer uses this input along with different in-car temperature sensors to control temperature and blower speed. When there is a problem with this sensor, performance will suffer and the A/C compressor clutch may not engage.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 895 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Outside Air Temperature Sensor - G17- harness connector. • CHECK: Outside Air Temperature Sensor - G17- component connector terminals x to x for resistance. • SPECIFIED VALUE: 1,300 Ω (+/- 500 Ω @ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 896 . – NO: ♦ REPLACE: Outside Air Temperature Sensor - G17- . Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 896 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Instrument Cluster Control Module - J285- . Refer to appropriate repair manual. • CHECK: Outside Air Temperature Sensor - G17- harness connector terminal 1 to the Instrument Cluster Control Module - J285- harness connector T32 / 20 for resistance. • CHECK: Outside Air Temperature Sensor - G17- harness connector terminal 2 to the Instrument Cluster Control Module - J285- harness connector T32 / 19 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Outside Air Temperature Sensor - G17- may fail under loaded operation; please swap a known good Outside Air Temperature Sensor - G17- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 896 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 896 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Instrument Cluster Control Module - J285- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Instrument Cluster Control Module - J285- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.25 Oxygen Sensor 1 After Catalytic Converter - GX7- , Checking

General Description

The Oxygen Sensor 1 After Catalytic Converter - GX7- downstream of the primary catalytic converter supplies the Engine Control Module - J623- with a voltage signal (nonlinear) indicating "rich" or "lean. If the primary catalytic converter is supersaturated with oxygen (lean mixture), Oxygen Sensor 1 After Catalytic Converter - GX7- will send the Engine Control Module - J623- a nonlinear signal indicating the lean mixture condition. The mixture is then enriched with fuel until the oxygen has been "displaced" from the catalytic converter. This condition, in turn, is registered by Oxygen Sensor 1 After Catalytic Converter - GX7- as a nonlinear signal indicating the rich mixture condition. The mixture is then leaned out by the Engine Control Module - J623- . If the nonlinear signal is received again, the mixture will again be en-

riched. The frequency, or period, during which the mixture is enriched or leaned out is variable, being dependent on the gas flow rate (engine load) at that moment.

Note the Oxygen Sensor After Three Way Catalytic Converter - G130- is also referred to as the Oxygen Sensor 1 After Catalytic Converter - GX7- .

The Oxygen Sensor 1 After Catalytic Converter - GX7- contains the following components:

- Oxygen Sensor After Three Way Catalytic Converter - G130-
- Heater For Oxygen Sensor 1 After Catalytic Converter - Z29-

The Oxygen Sensor After Three Way Catalytic Converter - G130- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 897 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- component connector terminal 1 to 2 for resistance. • SPECIFIED VALUE: 1 - 5 Ω (@ 25° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 898 . – NO: ♦ REPLACE: Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 899 .

Step	Procedure	Result / Action to Take
3	• IGNITION: ON. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 898 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 899 .
4	• RECONNECT: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ “3.3 Diagnostic Modes 01 - 09”, page 16 . • SPECIFIED VALUE: Mode 6 Pass. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ FAULT: Is intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 899 . – NO: ♦ GO TO: Step 5 ⇒ page 898 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91 / 11 or T91 / 91 depending on model year and vehicle for resistance. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 26 for resistance. • CHECK: Oxygen Sensor 1 After Catalytic Converter - GX7- harness connector terminal 4 to the Engine Control Module - J623- harness connector T91 / 25 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Oxygen Sensor 1 After Catalytic Converter - GX7- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 899 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 899 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.26 Oxygen Sensor 1 Before Catalytic Converter - GX10- , Checking

General Description

The Oxygen Sensor 1 Before Catalytic Converter - GX10- does not actually measure oxygen concentration, but rather the difference between the amount of oxygen in the exhaust gas and the amount of oxygen in air. Rich mixture causes an oxygen demand. This demand causes a voltage to build up, due to transportation of oxygen ions through the Oxygen Sensor 1 Before Catalytic Converter - GX10- layer. Lean mixture causes low voltage, since there is an oxygen excess. The Oxygen Sensor 1 Before Catalytic Converter - GX10- and catalytic converters are used in order to reduce exhaust emissions. Information on oxygen concentration is sent to Engine Control Module - J623- , which adjusts the amount of fuel injected into the engine to compensate for excess air or excess fuel. The Engine Control Module - J623- attempts to maintain, on average, a certain air–fuel ratio by interpreting the information it gains from the Oxygen Sensor 1 Before Catalytic Converter - GX10- . The primary goal is a compromise between power, fuel economy, and emissions. The heater for Oxygen Sensor 1 Before Catalytic Converter - GX10- is designed to minimize the time-to-readiness for closed-loop operation by heating the Oxygen Sensor 1 Before Catalytic Converter - GX10- as quickly as possible.

Note the Oxygen Sensor 1 Before Catalytic Converter - GX10- is also referred to as the Heated Oxygen Sensor - G39- .

The Oxygen Sensor 1 Before Catalytic Converter - GX10- contains the following components:

- ♦ Heated Oxygen Sensor - G39-
- ♦ Oxygen Sensor Heater - Z19-

The Oxygen Sensor 1 Before Catalytic Converter - GX10- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 900 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- component connector terminals 3 to 4 for resistance. • SPECIFIED VALUE: 1 - 5 Ω (@ 25° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 900 . – NO: ♦ REPLACE: Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 902 .
3	• IGNITION: ON. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 4 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 901 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 902 .

Step	Procedure	Result / Action to Take
4	• RECONNECT: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ “3.3 Diagnostic Modes 01 - 09”, page 16 . • SPECIFIED VALUE: Mode 6 Pass. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ FAULT: Is intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 902 . – NO: ♦ GO TO: Step 5 ⇒ page 901 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 1 to the Engine Control Module - J623- harness connector T91 / 43 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 2 to the Engine Control Module - J623- harness connector T91 / 44 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 74 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter - GX10- harness connector terminal 5 to the Engine Control Module - J623- harness connector T91 / 41 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Oxygen Sensor 1 Before Catalytic Converter - GX10- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 902 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 902 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.27 Radiator Shutter Motor - V544- , Checking

General Description

The Radiator Shutter Motor - V544- is used to control the mass air flow entering the lower air inlet. By closing the Radiator Shutter Motor - V544- , the head wind towards the radiator and into the engine compartment is reduced. This measure minimizes the warm-up cycle and, in addition, decreases the air resistance at the vehicle's radiator grille, thus reducing the drag coefficient (cd). At the beginning of the warm-up cycle, the Radiator Shutter Motor - V544- is closed and remains closed until the engine coolant temperature has reached a defined threshold value (80 °C). As soon as this temperature threshold has been exceeded, the Radiator Shutter Motor - V544- is opened to provide the required cooling. If the engine coolant temperature falls below the temperature threshold again during the driving cycle (e.g. due to engine stop phases during start/stop operation), the Radiator Shutter Motor - V544- is closed again. Outside of the warm-up cycle, the Engine Control Module - J623- determines the set point position of the Radiator Shutter Motor - V544- using the vehicle speed and the cooling requirement of single partial functions (e.g. engine, air conditioning, charge air).

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.

- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 903 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Radiator Shutter Motor - V544- harness connector. • IGNITION: ON. • CHECK: Radiator Shutter Motor - V544- harness connector terminals 1 to 4 for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 903 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 904 .
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Radiator Shutter Motor - V544- harness connector terminal 3 to the Engine Control Module - J623- harness connector T91 / 76 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Radiator Shutter Motor - V544- . Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 904 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 904 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.28 Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101- , Checking

General Description

The secondary air injection system sends air into the exhaust using passages in the cylinder head. This extra air injection takes place using the Secondary Air Injection Pump Motor - V101- that is powered by the Secondary Air Injection Pump Relay - J299- on a cold-start of the engine for about 45 – 100 sec. and serves to quickly heat the catalytic converter(s) for improved emissions.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".
- Vehicles with Manual Transmission, ensure Shifter Lever position is in "N" with Parking Brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 905 . – NO: ♦ GATHER more information from customer about the complaint.
2	• DISCONNECT: Secondary Air Injection Pump Relay - -J299-- . • IGNITION: ON. • CHECK: Secondary Air Injection Pump Relay - -J299-- harness connector terminal 1/86 to ground for voltage. • CHECK: Secondary Air Injection Pump Relay - -J299-- harness connector terminal 3/30 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 905 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 7 ⇒ page 906 .
3	• CONNECT: Jumper wire, Secondary Air Injection Pump Relay - -J299-- socket terminals 3/30 and 5/87. • IGNITION: ON. • SPECIFIED VALUE: The Secondary Air Injection Pump Motor - -V101-- should be running. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 905 . – NO: ♦ GO TO: Step 5 ⇒ page 906 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • DISCONNECT: Jumper wire, Secondary Air Injection Pump Relay - -J299-- socket terminals 3/30 and 5/87. • CHECK: Secondary Air Injection Pump Relay - -J299-- harness connector terminal 2/85 to the Engine Control Module - J623- harness connector T105 / 60 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Secondary Air Injection Pump Relay - -J299-- . Refer to appropriate repair manual. ♦ PERFORM: Road Test to verify repair. ♦ FAULT DOES RETURN: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ FAULT DOES NOT RETURN: ♦ GO TO: Step 7 ⇒ page 906 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 7 ⇒ page 906 .

Step	Procedure	Result / Action to Take
5	• DISCONNECT: Jumper wire, Secondary Air Injection Pump Relay - -J299-- socket terminals 3/30 and 5/87. • DISCONNECT: Secondary Air Injection Pump Motor - -V101-- harness connector. • CHECK: Secondary Air Injection Pump Motor - -V101-- harness connector terminal 2 to Secondary Air Injection Pump Relay - -J299-- socket terminal 5/87 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ GO TO: Step 6 ⇒ page 906 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 7 ⇒ page 906 .
6	• CHECK: Secondary Air Injection Pump Motor - -V101-- harness connector terminal 1 to ground for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Secondary Air Injection Pump Motor - -V101-- . ◆ PERFORM: Road Test to verify repair. ◆ FAULT DOES NOT RETURN: ◆ GO TO: Step 7 ⇒ page 906 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 7 ⇒ page 906 .
7	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.29 Secondary Air Injection Sensor 1 - G609- , Checking

General Description

The secondary air injection system blows air into the exhaust on a cold-start of the engine for 45 – 100 seconds and serves to quickly heat the catalytic converter(s) for improved emissions. A pressure based secondary air diagnostics function is used. In this system, the signal from the Secondary Air Injection Sensor 1 - G609- is evaluated by the Engine Control Module - J623- . The injected air quantity is determined from the pressure level.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 907 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Sensor 1 - G609- harness connector. • IGNITION: ON. • CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminals 1 to 3 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 908 . – NO: ♦ GO TO: Step 3 ⇒ page 908 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • For Beetle, CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • For Jetta/Passat, CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • For Beetle, CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • For Jetta/Passat, CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 909 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 909 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Secondary Air Injection Sensor 1 - G609- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 9 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω) – Was Value obtained?	– YES: ♦ REPLACE: Secondary Air Injection Sensor 1 - G609- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 909 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 909 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return the repair is complete. ♦ Return vehicle to customer.

3.6.30 Secondary Air Injection Solenoid Valve - N112- , Checking

General Description

The secondary air injection system injects air into the exhaust on a cold-start of the engine for about 45 – 100 s. and serves to quickly heat the catalytic converter(s) for improved emissions. A "pressure based secondary air diagnostics" function is used. In this system, the Engine Control Module - J623- controls the Secondary Air Injection Solenoid Valve - N112- , which allows the air quantity necessary to be injected into the exhaust.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions: ⇒ "1.1 Safety Precautions", page 2 .
- View clean working conditions: ⇒ "1.2 Clean Working Conditions", page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ "3.1 Preliminary Check", page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 910 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Solenoid Valve - N112- harness connector. • CHECK: Secondary Air Injection Solenoid Valve - N112- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 – 35 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 910 . – NO: ◆ REPLACE: Secondary Air Injection Solenoid Valve - N112- . Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 911 .
3	• IGNITION: ON. • CHECK: Secondary Air Injection Solenoid Valve - N112- harness connector terminal 2 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 910 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 911 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Secondary Air Injection Solenoid Valve - N112- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 21 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ TIP: The Secondary Air Injection Solenoid Valve - N112- may fail under loaded operation; please swap a known good Secondary Air Injection Solenoid Valve - N112- prior to continuing to the next step. ◆ GO TO: Step 5 ⇒ page 911 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 911 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.31 Secondary Air System - GX24- , Checking

General Description

The secondary air injection system sends air into the exhaust on a cold-start of the engine for about 45 – 100 sec. and serves to quickly heat the catalytic convertor(s) for improved emissions. A "pressure based secondary air diagnostics" function is used. In this system, the signal from Secondary Air Injection Sensor 1 - G609- is evaluated in the Engine Control Module - J623- . The injected air quantity is determined from the pressure level.

The Secondary Air System - GX24- contains the following components:

- ♦ Secondary Air Injection Solenoid Valve - N112-
- ♦ Secondary Air Injection Sensor 1 - G609-

The Secondary Air System - GX24- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in "P".

- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 912 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air System - GX24- harness connector. • CHECK: Secondary Air System - GX24- component connector pins 1 to 5 for resistance. • SPECIFIED VALUE: 10 to 35 Ω (at approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 912 . – NO: ◆ REPLACE: Secondary Air System - GX24- . Refer to appropriate repair manual. ◆ GO TO: Step 8 ⇒ page 914 .
3	• IGNITION: ON. • CHECK: Secondary Air System - GX24- harness connector terminal 1 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 912 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 8 ⇒ page 914 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Secondary Air System - GX24- harness connector terminal 5 to the Engine Control Module - J623- harness connector T105 / 21 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ If Secondary Air System - GX24- is 2 pins (populated), REPLACE: Secondary Air System - GX24- . Refer to appropriate repair manual. ◆ GO TO: Step 8 ⇒ page 914 . ◆ If Secondary Air System - GX24- is 5 pins (populated), GO TO: Step 5 ⇒ page 913 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 8 ⇒ page 914 .

Step	Procedure	Result / Action to Take
5	• IGNITION: ON. • CHECK: Secondary Air System - GX24- harness connector terminals 2 to 4 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 7 ⇒ page 913 . – NO: ♦ GO TO: Step 6 ⇒ page 913 .
6	• CHECK: Secondary Air System - GX24- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 35 for resistance. • CHECK: Secondary Air System - GX24- harness connector terminal 4 to the Engine Control Module - J623- harness connector T105 / 33 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Secondary Air System - GX24- may fail under loaded operation; please swap a known good Secondary Air System - GX24- prior to continuing to the next step. ♦ GO TO: Step 8 ⇒ page 914 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 8 ⇒ page 914 .
7	• CHECK: Secondary Air System - GX24- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 9 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Secondary Air System - GX24- . Refer to appropriate repair manual. ♦ GO TO: Step 8 ⇒ page 914 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 8 ⇒ page 914 .

Step	Procedure	Result / Action to Take
8	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return the repair is complete. ◆ Return vehicle to customer.

3.6.32 Three Way Catalytic Converter, TWC Checking

General Description

A catalytic converter is a vehicle emissions control device that converts toxic pollutants in exhaust gas to less toxic pollutants by catalyzing a redox reaction (oxidation or reduction). Catalytic converters are used in internal combustion engines.

General recommendations

Oxygen sensors OK.

No leaks or damage to exhaust system.

Prior to repair work, perform a preliminary check to verify the condition. Refer to ⇒ “3.1 Preliminary Check”, page 13 .

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Function test

Step	Procedure	Result / Action to Take
1	Activate Monitors: • Perform the function test in Diagnostic Mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ "3.3 Diagnostic Modes 01 - 09", page 16 . • End diagnosis and switch the ignition off. • If the specified values are exceeded:	♦ Check the exhaust system for leaks. ♦ If necessary, repair the leak(s) in the exhaust system. ♦ GO TO: Step 2 ⇒ page 915 .
2	O2 Sensor Monitoring: • Erase the DTC memory. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . • Perform a road test to verify repair. • If the DTC does not return:	♦ Generate readiness code. Refer to ⇒ "3.2 Readiness Code", page 14 . ♦ If no leaks are found in the exhaust system: ♦ Replace the catalytic converter with front exhaust pipe. Refer to the appropriate repair manual. ♦ GO TO: Step 3 ⇒ page 915 .
3	• Final procedure: • Perform a road test to verify repair.	• After the repair work, the following work steps must be performed in the following sequence: • Check the DTC memory. Refer to ⇒ "3.3.3 Diagnostic Mode 03 - Read DTC Memory", page 20 . • If necessary, erase the DTC memory. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . • If the DTC memory was erased, generate readiness code. Refer to ⇒ "3.2 Readiness Code", page 14 . • Return vehicle to Customer.

3.6.33 Throttle Valve Control Module - GX3- , Checking

General Description

Throttle valve operation occurs by an electric motor identified as EPC Throttle Drive - G186- located within the Throttle Valve Control Module - GX3- . It is controlled by the Engine Control Module - J623- with primary inputs from the Accelerator Pedal Position Sensor - G79- / Accelerator Pedal Position Sensor 2 - G185- as well as other peripheral inputs from EPC Throttle Drive Angle Sensor 1 - G187- and EPC Throttle Drive Angle Sensor 2 - G188- .

The Throttle Valve Control Module - GX3- contains the following components:

♦ Throttle Valve Control Module - J338-

♦ EPC Throttle Drive - G186-

♦ EPC Throttle Drive Angle Sensor 1 - G187-

♦ EPC Throttle Drive Angle Sensor 2 - G188-

The Throttle Valve Control Module - GX3- components cannot be serviced separately, it must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint Verified?	– YES: ♦ GO TO: Step 2 ⇒ page 916 . – NO: ♦ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 97%. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 917 . – NO: ♦ GO TO: Step 3 ⇒ page 916 .
3	• REMOVE: Throttle Valve Control Module - GX3- far enough so that the harness connector terminals are accessible. • DISCONNECT: Throttle Valve Control Module - GX3- harness connector. • IGNITION: ON. • CHECK: Throttle Valve Control Module - GX3- harness connector pins 2 to 6 for voltage. • SPECIFIED VALUE: About 5.0 V. • IGNITION: OFF. – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 917 . – NO: ♦ GO TO: Step 4 ⇒ page 917 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 54 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 6 to the Engine Control Module - J623- harness connector T105 / 56 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 6 ⇒ page 917 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 917 .
5	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 1 to the Engine Control Module - J623- harness connector T105 / 34 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 3 to the Engine Control Module - J623- harness connector T105 / 91 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 4 to the Engine Control Module - J623- harness connector T105 / 55 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 5 to the Engine Control Module - J623- harness connector T105 / 90 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Throttle Valve Control Module - GX3- . Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 917 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 917 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ♦ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC’s. ♦ If no DTC’s return the repair is complete. ♦ Return vehicle to customer.

3.6.34 Turbocharger Recirculation Valve - N249- , Checking

General Description

A Turbocharger Recirculation Valve - N249- keeps a portion of air running through the intake side of the turbocharger when the throttle valve is closed and boost pressure is still present. This keeps the turbocharger impeller from slowing down, reducing turbo lag when the throttle is applied again.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 918 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Turbocharger Recirculation Valve - N249- harness connector. • CHECK: Turbocharger Recirculation Valve - N249- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 3 to 15 Ω (at approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 919 . – NO: ♦ REPLACE: Turbocharger Recirculation Valve - N249- . Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 919 .

Step	Procedure	Result / Action to Take
3	• IGNITION: ON. • CHECK: Turbocharger Recirculation Valve - N249- harness connector terminal 1 to ground for voltage. • SPECIFIED VALUE: Battery voltage. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 919 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 919 .
4	• REMOVE: Engine Control Module - J623- . Refer to appropriate repair manual. • CHECK: Turbocharger Recirculation Valve - N249- harness connector terminal 2 to the Engine Control Module - J623- harness connector T105 / 66 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ TIP: The Turbocharger Recirculation Valve - N249- may fail under loaded operation; please swap a known good Turbocharger Recirculation Valve - N249- prior to continuing to the next step. ◆ GO TO: Step 5 ⇒ page 919 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 919 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ "3.3.4 Diagnostic Mode 04 - Erase DTC Memory", page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ "3.2 Readiness Code", page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return the repair is complete. ◆ Return vehicle to customer.

3.6.35 Vehicle Speed Signal, Checking

General Description

The Vehicle Speed Signal or VSS measures Transmission / Transaxle output or Wheel Speed from the ABS System. The signal is broadcasted over the CAN Bus. The Engine Control Module - J623- uses this information to modify engine functions such as ignition timing, A/F ratio, transmission shift points, and to initiate diagnostic routines.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF All electrical and electronic accessories.
- Vehicles with Auto. Transmission, ensure Selector Lever position is in “P”.
- Vehicles with Manual Transmission, ensure Shifter Lever position is in “N” with Parking Brake applied.
- Observe all safety precautions: ⇒ “1.1 Safety Precautions”, page 2 .
- View clean working conditions: ⇒ “1.2 Clean Working Conditions”, page 3 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ “3.1 Preliminary Check”, page 13 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 920 . – NO: ♦ GATHER more information from customer about the complaint.
2	• CONNECT: Scan Tool. • ROAD TEST: Vehicle. • CHECK: Scan Tool to Speedometer for accuracy. • SPECIFIED VALUE: Difference ≤ 10%. – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 921 . – NO: ♦ GO TO: Step 3 ⇒ page 921 .

Step	Procedure	Result / Action to Take
3	• CHECK: ABS system. • CHECK: ABS DTC’s. – Was the ABS system OK?	– YES: ◆ CHECK: CAN Bus wiring from Instrument Cluster Control Module - J285- to ABS Control Module - J104- . ◆ GO TO: Step 4 ⇒ page 921 . – NO: ◆ REPAIR: Any ABS concerns 1st. ◆ GO TO: Step 4 ⇒ page 921 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine Control Module - J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine Control Module - J623- . Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ “3.3.4 Diagnostic Mode 04 - Erase DTC Memory”, page 21 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ “3.2 Readiness Code”, page 14 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return the repair is complete. ◆ Return vehicle to customer.

DAB 12-14-17 OC

Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the VAG 1551 Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

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Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.

- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.

- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.

- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.

- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.

- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.

- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.

- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.

- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.

- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).

- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

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Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.

- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the VAG 1551 Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.

- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.

- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

back **OK**